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# CHEMICAL & METALLURGICAL ENGINEERING

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H. C. PARMELEE, Editor

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## Competition for Natural-Gas Supplies

AS A RESULT of the intensive search for petroleum, one of the largest natural-gas fields which the world has ever known was discovered near Monroe, La. This field lies more than 200 miles away from New Orleans and not much closer to any other prospective municipal user. As a consequence it is not at all likely that this territory can ever be profitably developed for city gas supply, since experience in other parts of the country indicates that pipe lines of such length are highly unprofitable investments with local regulation of the prices charged for gas. The question has been, therefore, and still remains, Who will use this natural gas to best advantage?

The first large users of natural gas in the Monroe field have been manufacturers of carbon black. Almost for the first time in history this use of gas has been encouraged by the federal government experts as perhaps the only economic method for the early development of this natural-gas territory. Now comes the question, however, as to whether other industries should not be encouraged to come in and use this splendid cheap fuel supply instead of allowing it to be consumed at rather low efficiency in the production of carbon black. Those who urge a change from the present policy insist that a larger number of workers and a greater value of finished product would result from many other industries using equivalent quantities of the gas. Those who contend on behalf of the carbon-black producer say that the other man can have the gas any time he is willing to pay more for it than it is worth for the manufacture of gasoline and carbon black under conditions now prevailing. Thus the carbon-black industry stands upon the dollars-and-cents argument—namely, that he who can afford to pay the most is entitled to the gas.

At the present time this question is decidedly acute. In fact, it is of such importance that the different groups within the Democratic party in that state are making an important campaign issue of the question of what should be done by the Governor and other state officials to control carbon-black manufacture in that state. As yet, however, there is no direct competition between industrial use and municipal gas supply. There is much talk about a pipe line to New Orleans; but capital will undoubtedly be very chary of making so large an investment with uncertain prospect as to the price that will be realized for the gas after it is delivered over these long distances. However, so long as there is threat of use for city supply, all gas-consuming industries are equally chary of making investments in this district.

Altogether this is another case where the best interest of the public is not being served because of extravagant claims or unjustifiable promises for cheap city supplies of natural gas. Such claims and promises never give a city any better gas supply and they certainly discourage that industrial development which is most wholesome and valuable for the community as a whole.

It will be well if officials and gas producers of the country at large refrain from encouragement of the public in the expectation of natural gas supplies from fields far distant from the municipal center. The officials and the producers will do far better for themselves, as well as for the public, by the encouragement of industrial developments for use of the gas, aiding either carbon-black plants or fuel-gas users who give promise of the greatest economic contribution to the community.

## Awaiting A Moses

HUMBLE and chastened by the trials of the past few years, the fertilizer industry stands today hesitant as to the further road, but willing to follow leadership toward better business methods and the observance of those economic principles essential to permanent industrial success. There can be no question as to these facts in the mind of anyone who participated in the recent convention of the National Fertilizer Association.

There are few industries that have suffered more through the post-war period of depression, and almost no other prominent industry has remained so long in the period of hard times. This has been the inevitable consequence of the financial difficulties that have confronted the agricultural community. Without ready money, with severely curtailed income, and with exhausted credit, the farm interests as a whole have been unable to buy fertilizer in quantities comparable with their needs. But increased buying power of the farmers alone will not save the industry. There is need also of constructive, idealistic leadership; and this leadership must be such as to inspire the industry to follow into the ways of progress.

In the past the business methods, particularly the price cutting and conditional sales practiced by the industry, have been inexcusable. The extension of credit by the industry has been far beyond that limit fixed by sound business. The industry now recognizes these facts. It will be the first to admit that change in business practices must be made. The response to recommendations of this sort made at White Sulphur Springs was spontaneous and apparently unanimous.

But someone must show the way. It is not enough that the industry know the destination. A Moses to lead out of the wilderness of hard times, bad business practices and mutual distrust and suspicion is sorely

needed. Let him arise and the industry will gladly and obediently follow into a period of assured business success. No one can deny that the welfare of the entire nation demands greater use of fertilizer than has ever been practiced in this country; all will profit by right leadership.

## The Radioactive Appliance as a Cure-All

TECHNOLOGY is continually being bombarded with questions propounded by the laymen as to the probable value of radioactive appliances the ostensible purpose of which appears to be to remedy almost all the ills that flesh is heir to. A satisfactory answer is difficult to formulate. The value of radium in medical work is indisputable, provided it is used with caution and by those with experience and knowledge. It is not surprising, therefore, that its curative powers have been exploited by the unscrupulous and the uninformed, although it is extremely difficult to substantiate a charge of fraud.

For instance, an enterprising individual might purchase a sufficient number of those luminous appendages that are used to hang on the electric-light cords, incase each in a pad and sell the article for the cure of rheumatism. Radium cures; the pad contains radium; where is the sting? Our manufacturer proclaims that "This company guarantees the —— —— —— pad to contain a definite quantity of actual radium." If his statement is questioned, he might retort that one-billionth part of one milligram is a definite quantity. When it comes to safeguarding the public against danger of burns, little trouble would be involved in proving that the radium in most of these appliances exists in so minute an amount that the possibility of physical injury to the wearer may be discounted. But whether such a pad as the one we have in mind could improve one's state of health, other than by auto-suggestion, is a problem that could be solved only by expert testimony and extensive investigation.

When the manufacturer of the radioactive pad departs beyond an elaboration of the simple statement that his apparatus contains radium and that radium may cure disease, he is likely to provide food for doubtful thought, if not evidence for conviction. It is well known, for instance, among scientists that the rate of emission of radiation from radium and radioactive substances cannot be controlled or altered or checked by human intervention. One manufacturer in California sells an appliance in which the radioactivity, according to the prospectus, may be "further increased by exposing the pad to sunlight, for," we learn, "the pad also possesses the property of absorbing the rays and radiant energy of the sun." Such a statement prompts inquiry into the good faith of the manufacturer and provides justification for suspicion; for the man who can develop an apparatus to insure the absorption of the "rays and radiant energy of the sun," which afterward can be "distributed throughout the system by placing the pad in contact with the body," has achieved what is unknown to science.

Another type of radioactive apparatus, also manufactured in California, purports to energize drinking water. It consists of a stoppered bottle in which there is a perforated container or cylinder, apparently of zinc or aluminum. The inventor and his Maker alone know what is inside this. Instructions indicate that the patient should drink four or five glasses of the water per diem, filling up the bottle with plain water after each withdrawal. This may be a device to persuade people with simple complaints to drink more water, the beneficial effect of which might be sufficient to deflect fame toward the manufacturer of the apparatus; or it may be that the generator provides an efficient method of treating water for effective medicinal purposes. We confess we do not know. However, it is to be noted that the apparatus is constructed so that the metals or other materials of which the cylinder is composed and incases continually produce a small amount of a very fine flocculent precipitate, the formation of which suggests to the chemically uninitiated that something effective is happening within.

The opinions of the American Medical Association on the subject of radioactive appliances such as those to which we have alluded should be worthy of dissemination. There is a great deal of misconception current; and many sufferers, physical and financial, are wondering whether the sale of radium for medicinal purposes should not be placed under control.

## A Danger to Scientific Progress

THE REV. ARTHUR T. ABERNATHY offers to bet the Rev. HENRY VAN DYKE or "any other Biblical infidel" $1,000 that he—i.e., Dr. VAN DYKE et al.—cannot prove "the materialistic evolution of man out of a lower order of species."

It is our good fortune to know Dr. VAN DYKE as a faithful minister of the gospel, for many years a professor at Princeton University, United States Minister Plenipotentiary to Holland during the war until the entry of the United States, when he resigned to put on a uniform and go with the troops as chaplain; president of the American Institute of Arts and Letters, author, poet, traveler, a gentleman and a scholar. We venture to predict that he will not enter the betting ring with this Abernathy preach-wallah. But the incident brings up a timely question.

ABERNATHY is one of a type of heresy-hunters and persecutors that has obtained a considerable foothold in this country since the war. It is a recrudescence of the witch-burning of Salem, of the holy Inquisition of Spain, of the championing of hatred, malice and persecution that seems to crop up whenever the morale of civilization is low. Its exponents press their gospel of the denial of the right of man to think for himself. They are all the same: Fundamentalists, witch-burners and holy inquisitors. The Ku-Klux Klan is the fruit of this same illusion of ignorance, grafted upon the lay mind.

They are not of the intelligentsia. In so far as they boast of being "100 per cent American" they are the left-overs, the shorts that develop in every race from imprudent matings in earlier generations. They are natural-born haters. Just now the philosophy of evolution is their target, but that is merely incidental. Anything that they cannot understand will serve them equally well.

ABERNATHY shows his character when he declares that his fight is "against Christian ministers and teachers who . . . violate every principle of spiritual and intellectual integrity by accepting pay to proclaim

a set of principles . . . and then . . . teach antagonistic doctrine." He can't see any further than the dollars, although the few that clergymen receive are usually contributed by the parishes which they serve.

Evolution, we repeat, is a great system of philosophy. Nobody claims inspiration or immutability for it. It seems to the learned and intelligent to be a dim vision of the process of creation. It is constantly undergoing transition, and it is in no sense considered as the frozen words of dogma. Just now a great change is in process in the evident eclipse of WEISSMANN'S theory that acquired characteristics are not transmitted. One may believe in special creation and still believe in evolution. One may accept the theory in whole or in part. It does not beget hatred and malice except among the inferiors who can't understand it, or among vindictive men who, owing to a defective social order, have been able to gain a cloak of authority and who fear for the security of their commands.

There are certain formulas that are designed to satisfy minds of a low order that lack the gift of understanding. Of such are six days of creation and a flat earth. Or man as a perfect creature designed for erect walking. But men like ABERNATHY or the Rev. JOHN ROACH STRATON or WILLIAM JENNINGS BRYAN can't understand these things, and so they are angry and want to destroy those that can understand them.

The Fundamentalists of today are cruel, un-Christian, vindictive, and they are the champions of ignorance. They behave according to their natures, and we can't change that. But when they proceed to write their vicious notions into the laws of the land it is time to recognize them as the pests that they are. They are entitled to life, liberty and the pursuit of happiness, but to allow them to rule or to dictate means the destruction of our liberties and the death of progress.

## Selling the Ultimate Consumer

FROM the viewpoint of extending public appreciation of the importance of the chemical engineering industries it is most unfortunate that so few of the products of these industries are recognizable as such by the ultimate consumer. We may be thankful, perhaps, for the extent that our manufacturers are thus relieved of catering to the evanescent whims of the consuming public, but we should not lose sight of the fact that serious problems are sometimes involved in the marketing and advertising of even the few chemical products that do reach the consumer directly.

An indication of the nature of these problems can perhaps best be brought out by considering a condition that might easily arise in almost any industry. Markets being established through national advertising, keen competition results in which one manufacturer may find himself at a decided disadvantage as regards access to supplies of certain raw materials. In an effort to retain his business he may find it possible to take other, more expensive raw materials and compound them in such a way as to produce a product that will present a more attractive appearance, although in reality it may be inferior to the original product for the purpose intended. Through intensive advertising this manufacturer may develop a wide public demand for his new, more attractive product, with the result that competing manufacturers are practically compelled to bring out a similar line in order to retain their share of the business. Even though the public is supplied with an inferior product, this condition may pass unnoticed for an indefinite period—simply because there may be no standards by which the individual can judge the relative efficiency of such products. Who can say, for instance, how little sodium silicate or how much naphtha should be used in a laundry soap? Is it safe to leave this to the housewife's preference, influenced as it is by some of the chemically ridiculous ads that grace the present-day billboard or magazine cover? Or should we insist on a more scientific basis of valuation and see that the public is converted to that basis?

National advertising, when rightly used, is a powerful tool for convincing the ultimate consumer of the inherent merits of those chemical products that pass directly to him. If in the past advertising has been misused to establish false standards of quality and usefulness, the responsibility lies with our own industries.

## Curtailment Of Education

AT INTERVALS during the past few years various states have undertaken to regulate the operations of schools conducting their courses in foreign languages. On June 4 the Supreme Court of the United States passed upon such legislation, ruling that any such state or municipal statutes are unconstitutional. But there is another form of curtailment which cannot be regulated by court degree, and it is almost equally deserving of criticism. It is the suppression of scientific information and technical knowledge regarding progress in the arts and industries that results from an unduly selfish management policy.

This sort of restriction upon general progress is all the more to be condemned because of its very insidious nature, being justified in the minds of many on the score of the right of the individual to the exclusive use of his own achievements. Fortunately, however, it is constantly becoming more and more clear that this undue restraint upon the distribution of technical information is far from profitable to the management following this practice. Industries are coming to see that the more persons they can encourage to begin investigation and development work in fields of peculiar interest to themselves the more rapid will be the advance of their industries and the greater will be the rewards that come to themselves and their individual companies. The day of the patent written to conceal rather than reveal has passed; the courts have been emphatic in their rulings that such patents are not valid. The day of secret processes is also rapidly passing; there are far too many competent investigators working in almost every field for any management to hope that it can long retain exclusively and secretly any outstanding technical developments that its own staff may make.

The time has come when industry must cease its efforts to curtail public knowledge of products or processes. The unrestrained acquirement of knowledge must be encouraged, with the sole restriction that the rights of the inventor or the owner of the patent shall be adequately and honestly conserved under the patent laws. Greater secretiveness than this is not alone contrary to public interest; it is inexpedient for industry itself.

**"The fertilizer business is a material business, but it is not necessary that we who have charge of its conduct should all turn into materialists. Ideals are necessary in business as well as in life, and without them we cannot succeed. As I see it, the industry, in the last 2 or 3 years, has been conducted on about a hundred per cent selfish basis."**

# *A Challenge to an Industry*

## *The President of the National Fertilizer Association, Frankly Criticising Some Business Practices, Makes a Stirring Appeal for Farsightedness*

THE ADDRESS of the president of the National Fertilizer Association has always been filled with business statesmanship. It is a document which the business and technical world may well anticipate with eagerness. Not only does it present the progress and position of a great industry but it holds up to the membership and the world methods, standards and ideals that must inspire to saner business thinking and cleaner business practice.

Everyone knows of the difficulties which the fertilizer industry has been through—difficulties not only of prodigious, heartbreaking liquidation, of unbelievable frozen credits, but difficulties of unstable prices during the reconstruction period. This instability was caused by the disorganized, selfish scramble after business by a few who not only disorganized the market but failed to help themselves materially.

So much by way of background. Hear then the president: "I asked a man close to the industry about the association. He replied that he thought there was a better feeling, a broader acquaintance and more real friendship among the members of the association than any association with which he had ever come in contact, but, he added, there is less real co-operation."

"The co-operation which the members have so generously given to the officers of the association, often at great personal sacrifice, declines, when it becomes a matter of business, to about the square root of minus one. Some evidence on this can be inferred from the report of the Federal Trade Commission dealing with an investigation of the industry. The report is a clean bill of health, but the correspondence attached is not particularly edifying. It was the old army game of 'passing the buck,' but to an extent almost never equaled. It was always the other fellow who was at fault, never the man who was writing.

"The result of this spirit of selfishness has been chaos in many departments of the industry. There has been more talk and discussion of conditions the last 3 years than probably there was in the whole previous history of the business. The result of these discussions, where the analysis was carried far enough, was a statement that the difficulties of the industry were brought about by a lessened consumption on the part of the farmer. There was every readiness by the individual to recognize this and admit it, but there was no willingness to admit that that particular difficulty applied to the individual himself. It was a bad situation that must be borne by the other man.

Gustavus Ober, Jr.
*President of the National Fertilizer Association*

"It is my firm conviction that individual prosperity is and can only be measured by the prosperity of the industry itself, and without prosperity in the industry there cannot be individual success. It may possible to beat the game for one season or more, but not over a period of years. Until this is realized, understood and accepted, there will be no foundation for future prosperity in the business. The fertilizer industry is itself, as has been stated repeatedly, basic and fundamental. There is a place for it and we all long for the day when it will again take its place as one of the best managed in the country.

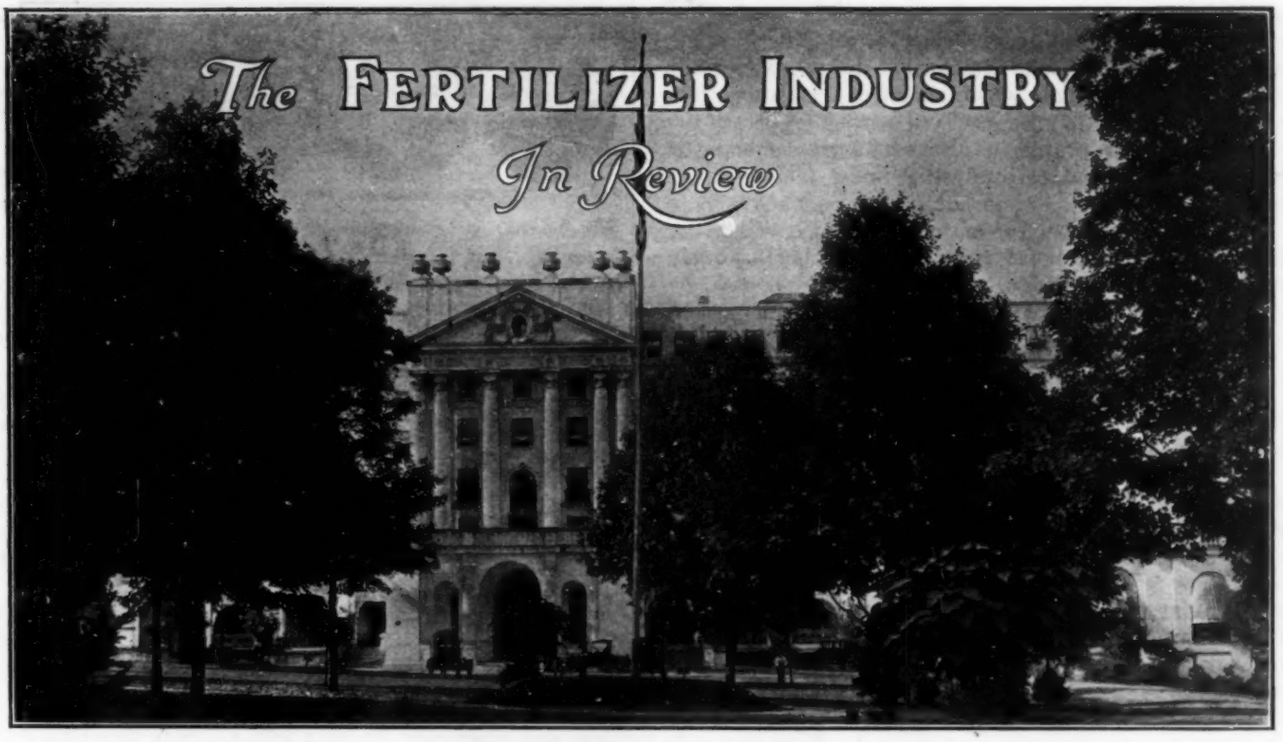
"It has been said that Boston was not a place but a state of mind, and I sometimes think the industry has lost its standing as a business and has become a state of mind, and until that state of mind is changed, the industry will not prosper.

"The needs of the association, as I now see them, are re-establishment of confidence of each one in his fellow man. This means the elimination of insincerity, and, in many cases, actual hypocrisy, and an honest-to-goodness desire to co-operate intelligently with one another. I am frank to say this last, I think, has largely been lacking. If this can be accomplished, we shall be a long way toward better business methods and practices, and until these are re-established upon a firm and sound basis, I, for one, believe that prosperity cannot be achieved.

"The industry, as a whole, has drifted without anchor and at the mercy of any opportunist wind that blew. This has been reflected in the lack of a definite policy of many of the individual companies.

"Many of the individual representatives of the fertilizer business have definite convictions as to business principles and economic theories, but most of us have without hesitation thrown these overboard and subscribed to policies that we know in our own hearts were unsound and unsafe. I ask for the re-establishment of our convictions and ideals, and I believe that with such to guide us, we cannot go far wrong."

Such enlightened leadership must ultimately have its effect. The enthusiasm with which this address was greeted had a spontaneity that was unmistakable. With leadership and enthusiasm the industry will shake itself free, but not until the individual can visualize himself as a part of the whole, successful in its success and growing with its growth.




## Conventions of National Fertilizer Association and Southern Fertilizer Association at White Sulphur Springs, W. Va., June 12 to 14, 1923, Deal With Industry's Problems of Production and Distribution

EDITORIAL STAFF REPORT

MORE "high-analysis" fertilizers and better selling methods were the two ideas that dominated the discussion at all sessions of both the National Fertilizer Association and the Southern Fertilizer Association, which held their meetings in White Sulphur Springs, W. Va., June 12 to 14. Each of these organizations was responsible for one of the open sessions; special meetings for consideration of the work of the soil improvement committee of the National Fertilizer Association and for executive discussion of some of the N.F.A. problems filled the remainder of the convention time.

The attendance, though not as large as during many former years, was at least 20 per cent above last year's. This and many other factors indicated an increasing confidence throughout the industry that the future business would be greater and more profitable. Although the individual companies composing the membership of this association have not been prosperous during the past few years, the association itself continues to show a good financial condition. The treasurer's report at the 1923 meeting indicated disbursements of approximately $18,000 and a generous balance still in the treasury. The secretary's report showed a net loss of only one member during the past year, a great contrast with the results during the preceding year, when the decrease in membership was 76.

### OFFICERS AND EXECUTIVE COMMITTEE ELECTED

As the five members of the executive committee who had served for the term ending 1923 were not eligible for re-election, the following five gentlemen were elected to succeed them for the term ending in 1926: L. A. Bailer, Swift & Co., Chicago; R. S. Cope, Reliance Fertilizer Co., Savannah, Ga.; W. D. Huntington, Davison Chemical Co., Baltimore; E. E. Newhouse, Arkansas Fertilizer Co., Little Rock, Ark.; A. E. Sheldon, Federal Chemical Co., Louisville, Ky.

All four officers of the association were re-elected to serve again for the coming year. They are: President, Gustavus Ober, Jr., G. Ober & Sons, Baltimore; vice-president, Spencer L. Carter, Virginia-Carolina Chemical Co., Richmond, Va.; treasurer, Irvin Wuichet, Wuichet Fertilizer Co., Dayton, Ohio; secretary, John D. Toll, *The American Fertilizer*, Philadelphia.

### PRESIDENTIAL ADDRESS

Gustavus Ober, Jr., president of the National Fertilizer Association, not only reviewed the present situation in the industry as a national organization but also sounded words of warning and gave recommendations for further progress which proved the keynote of the proceedings of the convention. He urged a much broader view for the future, with especial attention to the elimination of bad practices which the industry as a whole seems willing to admit to be wrong. The time is ripe, in Mr. Ober's opinion, for these reforms, because liquidation of the industry appears practically complete, and reduction of the industry's indebtedness and the reduction of bad debts of users seems to have progressed as far as it can go.

Mr. Ober discussed the important progress which had been made through the Washington office of the association in legislative matters and through the great advances of the soil improvement committee, which has brought about the adoption of standard formulas for "high-analysis" goods. In this connection, however, he pointed out that too rapid an advance to high-analysis

product must not be expected, for immediate adoption of high analyses to the exclusion of all other brands would undoubtedly make impractical the use of certain valuable raw materials which should not be altogether eliminated.

The permanent prosperity of the industry demands, in his opinion, a great reform which must include three things:

1. A re-establishment of mutual confidence within the industry as to the honesty and fair dealing of other members of the business.

2. The elimination of unsound business principles in sales and uneconomic practices with respect to price-cutting, credits and business methods generally.

3. The re-establishment in the mind and practice of each individual, as well as of each company, of high ideals and high principles of practice.

Among the ends for which the association should strive are greater co-operation and co-ordination in research; the extension of the period of fertilizer purchase over longer times both spring and fall; uniform standards of nomenclature and standard formulas for commercial fertilizers; and a trade code of ethics for the guidance of the business. The last of these recommendations was developed at considerable length by Mr. Ober.

The spontaneous and hearty applause which greeted Mr. Ober's recommendations indicated that the association as a whole was prepared to accept this plan and follow this leadership.

### Mixed Fertilizers in General Farming

Prof. Firman E. Bear, of the College of Agriculture, Columbus, Ohio, presented the one technical address of the association meeting, discussing the subject "Using Mixed Fertilizer in General Farming." He answered the question naturally raised in the minds of economists by the demonstration that the policy of using mixed fertilizer for general farming is sound. Professor Bear's paper is reproduced in slightly condensed form elsewhere in this issue.

Responding to Professor Bear's recommendations, Horace Bowker, of New York, congratulated him on the more practical and valuable service the agricultural stations of the country are now doing in fertilizer work. He pointed out that under the present conditions the industry and the investigators are working on such common basis as to permit active exchange of information to their mutual advantage.

### What the Soil Improvement Committee Does

Prof. William D. Hurd, director of the soil improvement committee, reported briefly at the regular session of the association on the purposes and scope of the work carried on by this agency. This committee also held a special evening meeting at which an illustrated lecture descriptive of some of the achievements and methods of work by the staff of the committee was given. The scope of this committee's activity is best explained in the form of a brief statement and statistical summary which it presented to the membership on this occasion, answering the question: "What does the soil improvement committee (N.F.A.) do?"

It maintains a staff which is constantly in the field gathering facts for "The Fertilizer Story," and it spreads this through all available channels for the benefit of the whole industry.

It co-operates with all existing agencies "in procuring and disseminating useful knowledge and information pertaining to the scientific and practical development of agriculture."

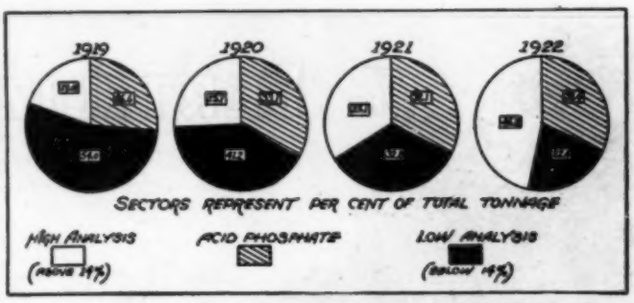



FIG. 1—PROGRESS OF HIGH ANALYSIS IN INDIANA
Prepared by soil improvement committee, National Fertilizer Association.

It keeps in contact with soil-fertility developments in twenty-six states.

Its staff attends the principal agricultural meetings and conventions, making contacts with the leaders in soil-fertility work, gathering material, and keeping the viewpoint of the fertilizer industry before these workers.

It is a service organization to its subscribers.

It maintains research fellowships at Vermont, Maryland, Indiana, Wisconsin and Iowa Experiment Stations, for the study of important problems affecting the fertilizer industry.

It assists in carrying on co-operative fertilizer tests with experiment stations, county agricultural agents and other agencies on important crops.

It issues a "News Bulletin" which goes monthly to 9,500 college and experiment station workers, county agricultural agents, representatives of the industry, bankers, railroad agriculturists and others.

It has waged an active campaign to eliminate low analyses and the wasteful multiplicity of brands. Sectional meetings have been held in Chicago, Boston and Baltimore. State meetings of salesmen held in five states—more to follow. Nineteen states now co-operating.

It furnishes educational material to colleges, county agents, vocational instructors and the industry; 1,200 sets of charts on commercial plant food, 1,026 sets of experiment station photo panels, 36 sets of lantern slides and 11 exhibits are in constant circulation and use by these agencies.

It operates a "News Service" to farm and other papers. More than 1,200 articles, picture strips, news items, etc., were sent out to and used by nearly 500 papers having a circulation of more than 58,000,000 readers.

It distributes literature to subscribers, education agencies, etc. More than 150,000 copies were sent out during the year.

The outstanding achievement of the committee during the past year is unquestionably its work in securing the adoption of standard high-analysis fertilizer formulas in various districts of the country. This work, which has previously been reported in the news pages of *Chem. & Met.*, is illustrated by Fig. 1, showing the progress in adoption of high-analysis goods in Indiana during the past few years.

### Cost Accounting Methods Recommended

On behalf of the cost accounting committee B. A. McKinney reported the great progress that has been made in the formulation of a system of cost accounting for companies that are engaged only in dry mixing. A system for companies manufacturing acid phosphate has not yet been developed, as this is a much more elaborate problem. The committee report on dry mixing is an elaborate text book of cost keeping and accounting methods. The committee felt this was essential since no simple outline of the classification of accounts would serve. The full report was not presented to the association in its general meeting, but was discussed in preliminary form at the executive sessions of the convention. It is planned that the changes and additions suggested as necessary by this executive consideration

be incorporated in the report and that it then be circulated in proof form for final comment before adoption. Pending this final criticism and revision, the report is not to be given out by the association except to members.

In the absence of C. F. Hagedorn, chairman of the chemical control committee, only a brief written communication describing this part of the association work was presented. During the past year the committee has been active in co-operation with the A.O.A.C. and the American Chemical Society in revision of methods of fertilizer analysis. The committee has recommended to the A.O.A.C. fertilizer referee certain definitions. Among these are a definition for basic phosphatic slag, which defines this as a material containing not less than 12 per cent $P_2O_5$ of which 80 per cent should be soluble; a definition for lime, providing that only oxide and hydroxide or equivalent magnesium compounds should be rated as available; and a definition of dry pulverized or shredded manure, which eliminates mixing other constituents.

The committee is giving particular attention to work on nitrogen availability. It urges further investigation on this subject as well as of methods for analysis of manure salts and for determination of ash.

### Southern Fertilizer Association Meeting

One of the high lights of the convention week was the session on Tuesday, June 12, devoted to the mid-year meeting of the Southern Fertilizer Association. As members of this district association are also generally members of the national association, the attendance was excellent and the meeting was of great interest.

President J. Russell Porter, of the Porter Fertilizer Co., Atlanta, Ga., summarized the general feeling of the membership in his presidential address at the opening of the session. Distinct progress toward normal conditions and general encouragement of the industry was noted, with particular confidence because of the improved financial situation of most fertilizer users and the distinct progress that has been made by the soil improvement committee of the association. The president, however, cited two distinct notes of warning to the membership. The first was a warning against overproduction, an outstanding cause of curtailed profits; the second was an indictment of conditional sales, not alone because of their bad effects upon the industry itself but also because of the severe condemnation by others which these practices bring upon the industry.

As objectives for the coming year, Mr. Porter recommends abundant but not excessive production; sale at definite prices without undue extension of credit and without discounts; the increase in proportion of "high-analysis" goods; the elimination of as large a number of the unnecessary brands and kinds as possible; and encouragement of co-operative buying on a county basis rather than through state-wide contracts, which are impractical if not impossible of successful application.

#### Boll Weevil a Dominating Factor

The agricultural program of the South was discussed by Dr. J. M. Harper, the director of the soil improvement committee of the association. The respects in which this territory demands a different fertilizer program than the rest of the country was emphasized, with particular attention to the dominance of the boll weevil trouble in all phases of the subject. For real progress, Dr. Harper believes that the industry must encourage greater production per acre, and to this end he points out that "the intelligent use of fertilizer is the only answer to the problems of the industry." He prophesies that with the understanding of the boll weevil problems this pest can be controlled within a few years so that prosperity will return to the Southern agricultural territory. He estimates, therefore, an increased output of 500,000 to 1,000,000 tons per year for the eleven Southern states alone. On this basis, he forecasts an annual demand for not less than 7,000,000 tons of fertilizer in this territory within a period of approximately 5 years.

C. A. Whittle, boll weevil expert of the soil improvement committee, insisted that plowing under by Oct. 15 insures killing of at least 97 per cent of the boll weevil and that early use of poison, generally about June 15 to June 30, will adequately control the rest. Other systems of boll weevil control may be successful, but none of them has been proved sufficiently so to justify support by the fertilizer industry. In the practice of these two recommended methods, it should be understood that control on a community basis is essential, for migration from farm to farm offsets any advantage of control by the individual on his own land alone.

The growing belief that generous use of fertilizer for boll weevil control is a measure of value is somewhat justified; but the risk is too great for one to depend upon this, upon cultural methods, or upon other remedies without the use of calcium arsenate also. In the use of calcium arsenate, the most successful poison yet thoroughly tested, dusting is the best practice yet proved. Some liquid applications still in trial stages are probably going to be demonstrated to be of value, but

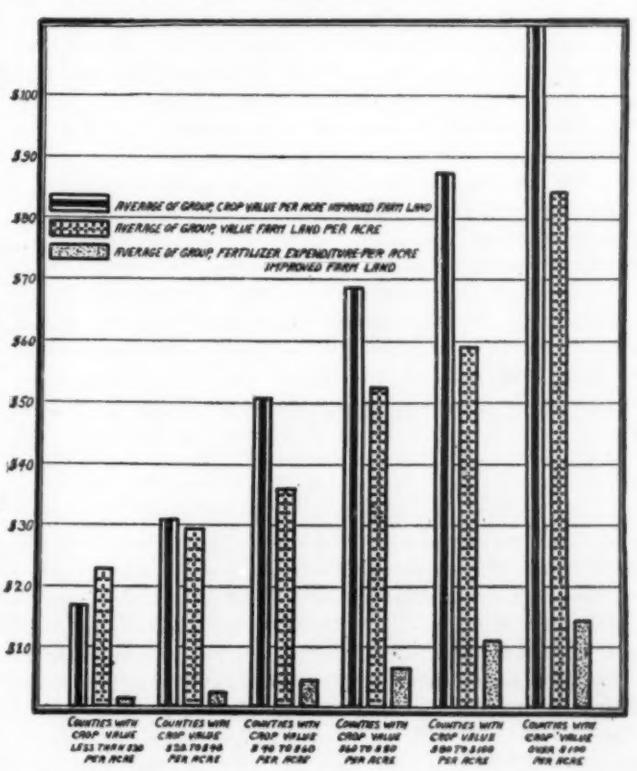



FIG. 2—CROP VALUES—FERTILIZER, EXPENDITURE—LAND VALUES

Showing relationship among these items for all counties of North Carolina, South Carolina and Georgia. Compiled from U. S. Census of 1920, by David D. Long, soil specialist, soil improvement committee, Southern Fertilizer Association.

none has yet reached the proved stage, in the judgment of Mr. Whittle.

With respect to the calcium arsenate situation in the South, Mr. Whittle pointed out that much delay had occurred in purchasing this year because of the belief that lower prices would follow and that perhaps the large quantities which were recommended for use might not be needed. He forecasts the crest of buying of calcium arsenate for about July 1. Until that peak of purchases is reached, it is difficult to tell whether the South will really experience a shortage.

### Fertilizer Use and Crop Values

The diversification of crops in the South has long been urged as a means of improving agricultural conditions and protecting against the boll weevil. But D. D. Long, soil specialist and economist of the soil improvement committee, pointed out that this tendency to diversify agriculture was severely limited by economic facts. At present the South, considered on the basis of acreage, is really diversified in its agriculture, but the fact that cotton is valued at more than 50 per cent of all the crops shows that it is not well diversified in value of products. However, even with generous fertilization, it is difficult to substitute other crops for cotton, as the yield in dollars per acre is almost invariably much less. For example, oats, forage and other substitutes yield from $17 to $30 per acre, while cotton averages more than $80 per acre. Moreover, many of the substitutes suggested are not suited to the soil conditions of the South, and others, such as sweet potatoes and tobacco, which give high yields in dollars per acre and which are suited to much of the Southern territory, are crops of limited market demand.

From the standpoint of the fertilizer industry, the South must be sold its fertilizer on the basis of increasing crop value per acre and increasing market value of land, rather than upon any basis that the fertilizer will afford opportunity for much greater diversification of crops. To show the relation between fertilizer use and crop and land values, Mr. Long presented statistics in graphic form. Fig. 2, which groups all counties of the three states North Carolina, South Carolina and Georgia, the largest fertilizer using states of the country, shows most convincingly how both crop value per acre and land value per acre increase with increasing consumption of fertilizers. Similar charts which have been published recently in the *Fertilizer Green Book* show in detail for various other states and other crops that the same relationship holds—namely, that crop value and land value increase markedly with increasing fertilizer consumption.

### Fertilizer Lowers Producing Costs

J. C. Pridmore, director of the soil improvement committee for the Shreveport district, discussed another phase of the relationship of fertilizer use to financial conditions at farm. Particularly he showed how the actual cost for lint cotton decreased per pound with increasing consumption of fertilizer and the attendant increase in yield. In one set of figures, an increase in yield from 100 to 300 lb. of lint per acre resulted in decrease from 30c. to 18c. per lb. as the net cost. Corresponding figures estimated for 1922 showed decrease from 25c. to 15c. as the net cost per pound of lint cotton.

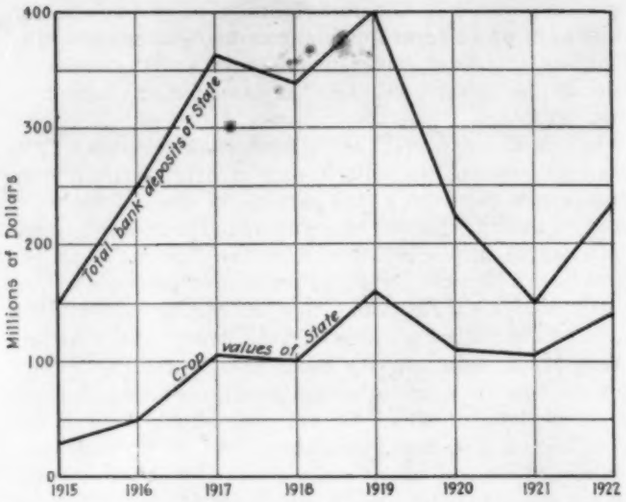



FIG. 3—RELATIONSHIP OF ARKANSAS CROP VALUE AND BANK ACCOUNTS

The increase in yields which produces this decrease in cost can be accomplished only by generous fertilizer application.

### Financing Fertilizer Sales

Recognizing the criticism commonly made of the fertilizer industry for conditional sales and excessive credits in sale of fertilizers, Mr. Pridmore argued for a future development of credit by the local merchants and the local banks instead of by the fertilizer manufacturer. As evidence that the banks and merchants would be justified in granting such credit for fertilizer purchase, he showed the direct relationship between the value of crops, which of course depends upon quantity of fertilizer used, and the bank deposits of any season. Very striking figures are shown in Fig. 3, which applies to the entire state of Arkansas for the period 1915 to 1922, inclusive. In view of the great increase in prosperity resulting from fertilizer use, Mr. Pridmore argues that the banker would be amply justified in financing purchases of fertilizer if the industry would decline to give the large credits now afforded. In fact this willingness has already been shown in some districts, where improved conditions prevail.

### Improved Selling Methods the Big Need

Discussing the industry as a whole, Mr. Ashcraft, of the Ashcraft-Wilkinson Co., Atlanta, urged in a vigorous manner an entire revision of the selling system of the Southern fertilizer industry. He pointed out as the great need of the present "the placing of really big men in the selling game." He urged, if no other way was found to accomplish it, that the cheap traveling salesman now employed be discharged and a limited number of high-caliber men who will take fair prices and stick to them be put in their place. At the present time the industry in the South "simply makes a price to cut it." As a consequence no one accepts seriously the prices quoted by the industry and the whole industry as a consequence is in disrepute.

The response to Mr. Ashcraft's arraignment of present practices indicates that the membership of the Southern Fertilizer Association is ready to accept this advice individually, if some means can be found for uniform practice of the methods proposed.

# Calculation of Vapor Recompression Evaporators

By D. A. Pridgeon
Engineering, University of Michigan

THE essential organs of a vapor recompression evaporator are shown in Fig. 1. The [illegible] heater for heating the feed liquor with the condensate leaving the evaporator, an evaporator, and a compressor, which in this case is a motor-driven turbo-blower.

It should be noted that there are two parts to the fluid circuit, the high pressure, $P_2$, and the low pressure, $P_1$; also that any portion of the fluid traverses the circuit but once. The fluid enters the low-pressure circuit at the preheater as feed liquor, passes through the preheater into the body of the evaporator, vaporizes and leaves through the vapor line to the compressor. The fluid enters the high-pressure circuit at the discharge side of the compressor, passes to the steam basket, condenses, leaves the machine through the preheater and is collected in a trap below the evaporator.

**It is possible to calculate with a moderate degree of accuracy the heat economy and capacity of vapor recompression evaporators.**

**The apparatus will come to equilibrium and establish its own temperature difference. This temperature difference is a direct function of the heat losses from the system.**

**The power required is a direct function of the temperature difference.**

**The economy is an inverse function of the temperature difference.**

**Elevation of boiling point decreases the working temperature difference, and therefore decreases the capacity of a given heating surface.**

The action of the machine may be studied to advantage in connection with the temperature-entropy diagram shown in Fig. 2. The vapor is drawn into the compressor through the suction pipe from the vapor space of the evaporator. It may be assumed that the vapor entering the compressor is in the saturated state at the temperature $T_1$, which may be taken equal to the temperature corresponding to the pressure $P_1$ in the vapor space of the evaporator. This state is represented by point $B$. The vapor is compressed adiabatically to a final pressure $P_2$, which is the pressure corresponding to the temperature $T_2$ of saturated steam in the steam basket. Adiabatic compression is represented by $BC$.

The superheated vapor in the state $C$ is discharged into the steam basket, where heat is abstracted from it by the liquor in the evaporator. First the superheated vapor is cooled to the state of saturation; this process is represented by the line $CD$, and the heat abstracted by the area $C_1CDD_1$. Then heat is further removed at the constant temperature $T_2$ (and pressure $P_2$) and the vapor condenses. At the end of the process the fluid is in the liquid state. Its state is represented by the point $E$ on the liquid curve, and the heat abstracted by the area $D_1DEE_1$. The condensate then leaves the steam basket and enters the preheater, where it is cooled to the temperature $T_3$ of the entering liquor. Its state is represented by the point $F$ and the heat abstracted by the area $E_1EFF_1$.

The feed liquor enters the preheater at the temperature $T_3$, and its state is represented by the point $F$. In this theoretical case the temperature of the condensate leaving the preheater is taken as the temperature of the entering feed liquor. The reason for this is obvious from the discussion that follows. In practice, however, the temperature of the condensate leaving the preheater would be above that of the entering feed liquor. The temperature of the liquor entering the evaporator lies along the line $FA$. Assuming no elevation of boiling point, the liquor is raised to the temperature $T_1$, corresponding to the pressure $P_1$ of the vapor space. Its state is then represented by the point $A$, and the heat absorbed in raising its temperature from $T_3$ to $T_1$ is represented by the area $F_1FAA_1$. The temperature of the vapor in the steam basket being higher than that of the liquor, heat is absorbed by the liquor and it vaporizes at constant pressure $P_1$. This process is represented by the line $AB$ and the heat absorbed from the vapor in the steam basket by the area $A_1ABC_1$.

The work done on the fluid is the difference between $Q_1$, the heat absorbed by the liquor, and $Q_2$, the heat rejected to the steam basket and preheater. We have then

$Q_2$ = area $C_1CDEFF_1$
$Q_1$ = area $F_1FABC_1$

The area $F_1FAA_1$ is common to both.

Therefore, if $AW$ represents work expressed as heat units,

$AW$ = area $C_1CDEAA_1$
— area $A_1ABC_1$
= area $BCDEAB$

In the cycle above described, the heat rejected to the steam basket and preheater is equal to the heat absorbed by the liquor, therefore $Q_2 = Q_1$ and $AW = 0$. In practice, a temperature difference must be maintained between the heating steam and the evaporating liquor, and a temperature difference consequently implies a pressure difference. Therefore $AW$ cannot be equal to zero. Since work is done in maintaining this pressure difference, means must be provided for removing this work from the system in the form of heat. In this particular case this can be done in only two ways: heat removed by the thick liquor and by radiation. These being constant, $AW$ is constant and therefore the temperature difference is constant and rather small.

The amount of heat added to any system in a given time must necessarily be taken away from the system in the same time if the initial condition of the system is to be maintained. So in our case if a specified temperature difference (which is a pressure difference) is to be maintained between the steam and boiling liquor by the compressor, the heat added by the compressor in the form of work must be removed. If the heat lost by radiation and through thick liquor discharge is not sufficient to remove all the heat added by compression.

Paper presented at the Wilmington, Del., meeting of the American Institute of Chemical Engineers, June 20-23, 1923.

it will be necessary to blow off steam from the vapor space. If steam were not blown off, the pressure of the vapor space would rise and thus decrease the temperature difference, thereby decreasing the work of compression and decreasing the heat added to the system in unit time. If the heat discharged from the system by radiation and through thick liquor is greater than that added by work of compression, heat must be added from some external source in order to maintain the specified temperature difference. If heat is not added from an external source, the temperature difference will increase until the work of compression is equal to the heat lost from the system by radiation and through thick liquor. With a given set of conditions it is impossible to maintain a predetermined temperature difference. The machine will come to equilibrium and maintain its own temperature difference. If no heat were lost from the apparatus, the boiling point would rise to that of the steam temperature, and there would be no temperature difference and consequently no evaporation. The temperature difference is a function of the net amount of heat lost from the apparatus per unit time.

### Calculation of Work Required

The cycle of the vapor recompression evaporator transferred to the total heat-entropy plane is shown in Fig. 3. (This figure is a part of the Mollier diagram, which can be found in Marks and Davis' "Steam Tables and Diagrams.") The same letters in Figs. 2 and 3 denote the same states. Adiabatic compression is represented by $BC$, the point $B$ lying on the saturation curve $S''$ (dry and saturated steam) at its intersection with the constant pressure line $P_1$. Line $CE$ represents the cooling and condensation of the steam at constant pressure $P_2$, and line $EF$ the cooling of the condensate in the preheater. The heat $q_2$ given up by unit weight of steam in the steam basket and by the condensate in the preheater is therefore the difference of thermal potential (total heat) between the states $C$ and $F$:

$$q_2 = ic - if \quad (i = \text{total heat in 1 lb. of steam})$$

This heat is represented by the segment $CF_1$. Point $E$ represents condensate at the pressure $P_2$ in the steam basket. Point $A$ represents the state of the liquor in the evaporator. Point $F$ represents the state of the condensate leaving the preheater and the state of the liquor entering the preheater. The process $FA$ is the heating of the liquor in the preheater, and the process $AB$ is the vaporization in the evaporator, during which heat $q_1$ is abstracted from the preheater and steam basket.

$$q_1 = ib - if$$

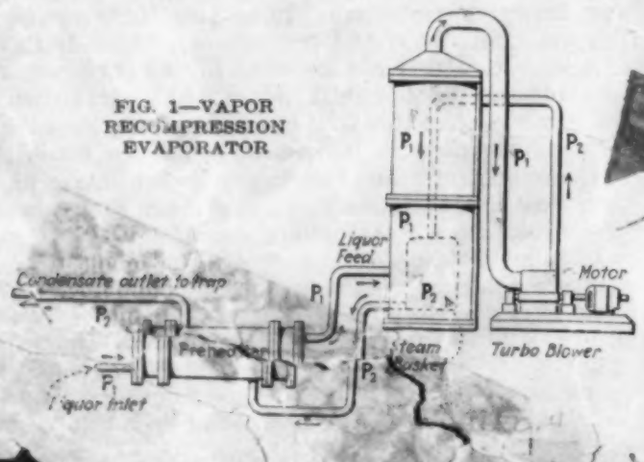
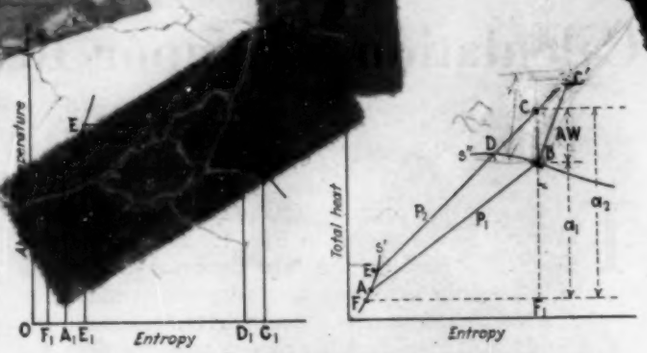



FIG. 1—VAPOR RECOMPRESSION EVAPORATOR




FIGS. 2 AND 3—TEMPERATURE-ENTROPY AND HEAT-ENTROPY DIAGRAMS

This heat is represented by the segment $BF_1$

$$AW = q_2 - q_1 = (ic - if) - (ib - if) = ic - ib$$

That is, the work required in thermal units is the change of thermal potential during the adiabatic compression.

If $M$ equals the weight of liquid evaporated per hour, the work required per hour expressed in thermal units is $M\ (ic - ib)$, and the net power in kilowatts required to drive the machines $= M \dfrac{(ic - ib)}{3420}$

If $n$ = efficiency of the compressor

$$\text{Gross kw.} = M \frac{(ic - ib)}{3420n}$$

The conceptions of steam compression differ from air compression in that adiabatic instead of isothermal compression is taken as 100 per cent efficiency. Steam compressors are not 100 per cent efficient. Internal friction between the moving parts and between the steam and its path through the compressor is converted into heat, which tends further to superheat the compressed vapor above that corresponding to adiabatic compression. This causes an increase in total heat, entropy and temperature without increasing the pressure.

If the compressor were water-jacketed this superheat could be removed at least in part. The work of compression for a given pressure difference would be decreased, thus increasing the efficiency of the compressor. The heat taken up by the water jacket is not available for evaporation, as it would be if allowed to remain as superheat in the compressed steam. Water-jacketing compressors is established practice in air compression. It might well be considered in connection with steam compression. In the following problems, however, the compressor is assumed to be not water-jacketed. Since the compressor is not 100 per cent efficient, compression is represented in Fig. 2 and Fig. 3 by the line $BC$ and not by $BC$.

Following are four problems representing hypothetical cases and are not to be taken as the conditions that actually exist but conditions that are assumed to exist.

### Problem I

How much power is required to evaporate 10,000 lb. water per hour from a solution boiling at 212 deg. F., assuming heat losses by radiation, etc., are equal to the heat added in form of work to maintain the temperature difference of 18 deg. F.? Compressor and motor efficiency 60 per cent (based on adiabatic compression as 100 per cent).

*Solution*—A temperature of 230 deg. F. corresponds to a pressure of 20.77 lb. for dry and saturated steam. To

find the total heat in a pound of steam which has been compressed adiabatically from 14.7 lb. to 20.77 lb., start on the Mollier (total heat-entropy) diagram at the intersection of the constant pressure line 14.7 lb. with the saturation curve and follow the constant entropy line vertically upward to the constant pressure line 20.77 lb. and read at the left of the diagram off the constant total heat line 1,177 B.t.u.

The power required is:

$$\frac{M(ic - ib)}{3420n} = \frac{10{,}000(1177.0 - 1150.4)}{3420 \times 0.60} = 129.5 \text{ kw.}$$

PROBLEM II

From 12,000 lb. of solution fed to the evaporator per hour 10,000 lb. is evaporated. Boiling point is 212 deg. F., vapor dry and saturated. Liquor enters preheater at 60 deg. F. Condensed steam leaves preheater at 100 deg. F. Radiation 0.25 per cent (based on evaporation). Compressor efficiency 63 per cent (based on adiabatic compression as 100 per cent). Motor efficiency 95 per cent. Specific heat of solution leaving and entering is 1.

(*a*) What is the temperature difference?

(*b*) How much power is required?

(*c*) If the coefficient of heat transmission is 250 B.t.u. per hr. per deg. F. per sq.ft., how much heating surface is required in the evaporator?

*Solution*—To simplify calculations, use 60 deg. F. as a datum for calculating total heat entering and leaving machine.

*Heat entering apparatus:*

(*a*) Heat entering the apparatus as such equals 0, as the feed liquor enters at 60 deg. F.

*Heat leaving apparatus:*

(*a*) In condensate
$10{,}000(100 - 60) = 400{,}000$ B.t.u.

(*b*) In thick liquor
$2{,}000(212 - 60) = 304{,}000$ B.t.u.

(*c*) By radiation
$10{,}000 \times 970.4 \times 0.0025 = 24{,}260$ B.t.u.

Total 728,260 B.t.u.

All of this 728,260 B.t.u. leaving the apparatus is added by the compressor in the form of work; therefore

$\frac{728{,}260}{10{,}000} = 72.8$ B.t.u. added to each pound of vapor by the compressor.

1150.4 + 72.8 = 1223.2 B.t.u. total heat in 1 lb. of heating steam. If the compressor were 100 per cent efficient, use the figure 1223.2. Since the compressor is 63 per cent efficient, use 1150.4 + (72.8 × 0.63) = 1196.2. To find the pressure of the steam leaving the compressor enter the Mollier diagram at 1196.2 and move horizontally to right to a point on constant entropy line directly above the intersection of the saturation curve with the constant pressure line for 14.7 lb. This falls on the constant pressure line for 26.4 lb. The temperature corresponding to 26.4 lb. from steam tables is 243.1 deg. F. The temperature difference is 243.1 − 212 = 31.1 deg. F. Temperature differences are taken as the difference in temperature between dry and saturated steam at the pressure $P$, and the temperature of the boiling liquid. From steam tables steam at 26.4 lb. with a total heat of 1,223.2 B.t.u. is superheated 130 deg. F. The actual temperature of the steam is 243.1 + 130 = 373.1 deg. F.

(*b*) The power required is:

$$\frac{M(ic - ib)}{3420n} = \frac{10{,}000 \times (1196.2 - 1150.4)}{3420 \times 0.63 \times 0.95} = 229 \text{ kw.}$$

(*c*) The heating surface $= \frac{10{,}000 \times 1011.6}{250 \times 31.1} = 1300$ sq.ft.

PROBLEM III

Conditions are the same as Problem II except vapor is wet. The

(*a*) From the Mollier diagram the total heat in 1 pound of vapor [illegible] total heat in 1 [illegible] 13.5 B.t.u.

If the [illegible] per cent efficient, the figure 1213.5. Since [illegible] efficient, use 1,140.7 + (72.8 × 0.63) = 1,[illegible] To find the pressure of the steam leaving the compressor, enter the Mollier diagram at 1,186.5 and move horizontally to the right to a point on the constant entropy line directly above the intersection of the constant quality 99 with the constant pressure line for 14.7 lb. This falls on the constant pressure line 26.8 lb. The temperature corresponding to 26.8 lb. from the steam tables is 244 deg. F. The temperature difference is 244 − 212 = 32 deg. F. From the steam tables steam at 26.8 lb. with a total heat of 1,213.5 B.t.u. is superheated 107 deg. F. The actual temperature of the steam is 244 + 107 = 351 deg. F.

(*b*) The power is the same as in Problem II.

(*c*) The heating surface $= \frac{10{,}000 \times 1001.1}{250 \times 32} = 1250$ sq.ft.

PROBLEM IV

From 14,000 lb. of brine fed to an evaporator per hour 10,000 lb. of water is evaporated and 4,000 lb. of wet salt is drawn from the machine. Pressure in the vapor space is atmospheric. Elevation of boiling point is 15 deg. F., hence boiling point is 227 deg. F. Brine enters preheater at 60 deg. F. Condensed steam leaves preheater at 100 deg. F. Radiation 0.25 per cent (based on evaporation). Compressor efficiency 63 per cent. Motor efficiency 95 per cent. Specific heat of condensate taken as 1. Specific heat of wet salt taken as 0.30.

(*a*) What is the temperature difference?

(*b*) How much power is required?

(*c*) If the coefficient of heat transmission is 250, how much heating surface is required in the evaporator?

*Solution*—As in Problem II, use 60 deg. F. as a datum.

*Heat entering apparatus:*

(*a*) Heat entering apparatus as such equals 0, as brine enters at 60 deg. F.

*Heat leaving apparatus:*

(*a*) In condensate
$10{,}000(100 - 60) = 400{,}000$ B.t.u.

(*b*) In wet salt
$4{,}000 \times 0.3(227 - 60) = 200{,}400$ B.t.u.

(*c*) By radiation
$10{,}000 \times 970.4 \times 0.0025 = 24{,}260$ B.t.u.

Total 624,660 B.t.u.

$\frac{624{,}660}{10{,}000} = 62.5$ B.t.u. added to each pound of vapor by the compressor.

1150.4 + 62.5 = 1212.9 total heat in 1 lb. of heating steam. If the compressor were 100 per cent efficient, use the figure 1212.9. Since the compressor is 63 per cent efficient, use 1150.4 + (62.5 × 0.63) = 1189.8. Using the Mollier diagram as before, find the pressure of the steam leaving the compressor to be 24.4 lb. The temperature corresponding to 24.4 lb. is 238.7 deg. F. The temperature difference is 238.7 − 227.0 = 11.7 deg. F. From the steam tables, steam at 24.4 lb. with a total heat of 1212.9 B.t.u. is superheated 111 deg. F. The actual temperature of the steam is 238.7 + 111 = 349.7 deg. F.

(*b*) The power required is:

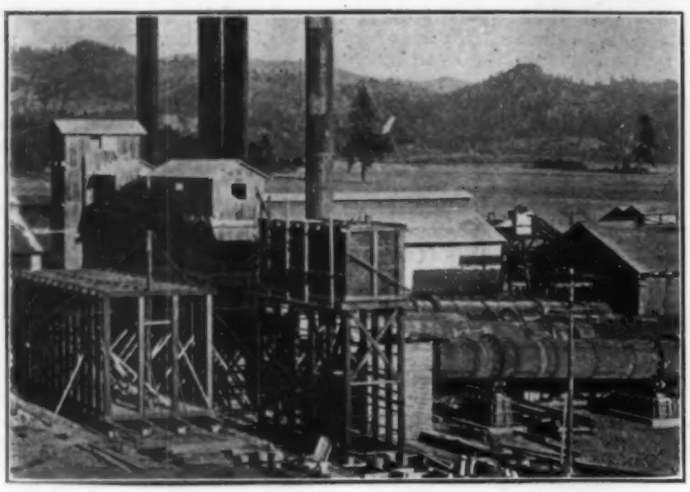
$$\frac{10{,}000 \times (1189.8 - 1150.4)}{3420 \times 0.63 \times 0.95} = 192.4 \text{ kw.}$$

(*c*) The heating surface is:

$$\frac{10{,}000 \times 1005.9}{250 \times 11.7} = 3340 \text{ sq.ft.}$$

## Perils in Petroleum Production

At recent gatherings of oil men there was sounded a note of warning to the petroleum industry because of overproduction of crude and excessive stocks of gasoline. The members of the American Oil Men's Association have recently urged a vigorous buying movement by jobbers and distributors as a means of preventing imminent complete occupation of storage capacity. H. G. James, president of the Missouri Oil Men's Association, said that in some producing sections of the mid-continent field only 50 per cent of the companies' refining capacity is in operation and that many refiners were offering gasoline to jobbers at less than production cost. The cool weather is blamed for the condition.



# Opening Up New Fields for an Industry

EDITORIAL STAFF REPORT

**National Lime Association shows remarkable technical strength at its fifth convention. The development of quick-setting lime plaster, the manufacture of lime partition blocks and the extended use of lime in both asphalt and concrete roads are announced by the association's research organization.**

THE National Lime Association sandwiched an open meeting between the executive sessions (which are open only to National Lime Association members) during its fifth annual convention in New York City, June 13 to 15. The effort was distinctly worth while. It gave a picture of the activities of the National Lime Association and of the excellent research work which is being carried out.

President Charles Warner presided, in the West Ball Room of the Hotel Commodore. In his opening remarks he pointed out that the Lime Association was not aiming to increase dividends this year or next year, but was working for the lime industry 10 years from now. The association can never be a trouble-shooter for the industry. It must have a long-time vision to be of any service. The president then introduced W. R. Phillips, general manager of the National Lime Association, who briefly outlined the work and the organization of the association. He enunciated the policy of the management of the association as being that of specializing in several of the most important problems and of making an intensive, rather than an extensive, survey. Naturally, all efforts cannot be confined along a few lines, but much better progress is made if problems are cleaned up and finished.

Four department reports were read by the men most closely associated with the various lines of activity. J. A. Slipher discussed the use of lime in agriculture. A survey of twenty states showed that, in spite of intensive campaigns on the part of universities and experiment stations, limestone has never been popular or widely used. Many reasons lie back of this unwillingness to adopt this material, the principal reasons being practical ones, in that the use of limestone does not fit in well with conditions of work on a farm. Mr. Slipher reported an increased use of burnt lime. pointing to a still greater use in time to come.

R. P. Brown discussed the work of the construction department, and interesting figures were read which showed an increase of 48 per cent in the tonnage of lime used in building in 1922 over 1921.

W. A. Freret took up the use of lime in highways—both in their construction, whether they be of asphalt or of concrete, and in the painting of objects along the side of the road and the borders on the roads, to make driving at night easier.

M. E. Holmes, chemical director of the association, outlined the activities of this department, including a brief résumé of the work done by the Fellows of the National Lime Association in the great institutions where these Fellows are located and by the central laboratory of the National Lime Association.

Following this, two papers were presented on manufacturing subjects. The first was by Oliver Bowles, mineral technologist, U. S. Bureau of Mines, and recently appointed head of the New Brunswick Experimental Station, which is to be devoted to non-metallic minerals. Mr. Bowles announced that one of the men at this laboratory would undoubtedly be placed principally on the utilization of limestone quarry waste.

## HEAT LOSSES IN LIMEKILNS

The second was by V. J. Azbe, on the heat loss in limekilns. A great deal of trouble in lime plants comes from the improper proportioning of fuel and air. $CO_2$ is a very significant figure in boiler gases, but it is even more significant in limekilns, for the percentage of $CO_2$ can be tied in very closely with the production of lime per ton of coal. For example, with 25 per cent $CO_2$ in the waste gases from the kilns a production of perhaps 3 tons of lime per ton of coal is indicated, whereas with 31 per cent $CO_2$ a 5 to 1 ratio is approached. Similarly, the loss of lime output can be determined by oxygen analysis, 2 per cent being about the optimum. An additional loss of heat, due to the withdrawal of hot lime, is accounted for and estimated from another chart, the temperature of the lime being variable and the amount of loss being due to the quantity of lime removed and the temperature. In addition to the losses already enumerated, there is an additional radiation loss which can also be estimated.

## LIME PARTITION BLOCKS—A REMARKABLE ADVANCE

The amazing story of the manufacture of lime partition blocks was told by Mr. Freret and W. E. Emley of the Bureau of Standards, illustrated with motion pictures of the machine in operation, taken in the plant of the International Clay Machinery Co., where the machines for manufacturing these blocks are being constructed. Investigation was started on March 3, 1923, and completed blocks were tested in the Bureau of Mines during April, so that the [illegible] can plead "guilty" of [illegible] conducting the [illegible] different types of blocks were manufactured, containing lime putty [illegible] wood shavings,

asbestos and other materials in widely varying proportions. The manufactured blocks will compete with gypsum blocks and with clay tile. In the test of the Bureau of Standards the lime blocks were found to be, in general, heavier than gypsum but lighter than clay, stronger than gypsum but again not as strong as clay, both in transverse and compressive strength. They have a greater absorption than clay but considerably less absorption than gypsum, and the permeability is so low that the block would probably have to be scored in order to hold plaster well.

### Quick-Setting Lime Plaster

Perhaps the most dramatic story of all was that on quick-setting lime plaster. The investigation has been under way somewhat less than 6 months at the present time. What was wanted above everything else was a lime plaster that would set quickly and comparably with gypsum plaster. Lime plaster requires about 20 hours to set, whereas gypsum plaster sets in about 4 hours. The work was carried out along very comprehensive lines. One Fellow of the association working under R. T. Haslam at M.I.T. studied merely the compounds of lime, water and carbon dioxide. Another Fellow, under F. C. Mathers of Indiana University, undertook an Edison research to determine what materials, if any, would hasten the set of lime plaster. The third Fellow, under J. R. Withrow, of Ohio State University, studied the effect of burning conditions on time of set.

Professor Mathers' work met with a considerable measure of success, inasmuch as several methods of decreasing time of set were worked out. The first was by the addition of carbon dioxide to not over 5 per cent by weight. The second was by the addition of a water-soluble sulphate, ferric, magnesium and sodium sulphates being among the best. A mixture of 60 parts calcium oxide, 61 parts of water, 1 part of ferric sulphate and 3.6 per cent of carbon dioxide set in half an hour, as against 20 hours for a straight lime process. It is a simple matter to retard these quick-setting plasters as is done in the case of gypsum plasters, pure sugar being used in experimental work.

Professor Withrow reported that no relation between the time or temperature of burning and the set of lime plaster could be determined. Professor Haslam's report was an exceedingly interesting physical chemical study of the compounds that exist between calcium oxide and water, calcium oxide and carbon dioxide, and calcium oxide and carbon dioxide and water. Two general methods were adopted in carrying out this work. One was the study of a physical property of compounds or mixtures to see at what point a definite change of this particular property indicated a change in composition. The other method was to make the compounds themselves in several different ways, and then by analysis determine whether a new compound had been prepared.

Plotting data obtained from the literature on the solubility of lime, a transition point was noted at 60 deg. All attempts, however, to prepare a di-hydrate or a higher hydrate of lime failed, and on a redetermination of solubilities no transition point was noted. Also the vapor pressure plotted as the logarithm against the reciprocal of the temperature showed no breaks in the curve, indicating a single compound, the mono-hydrate. Similar results were obtained with calcium carbonate, only one compound being recognized. And, finally, the system $CaO$-$H_2O$-$CO_2$ was studied on both the acid and basic side of equilibrium and at absolute neutrality, three compounds being established.

### Data on Quick-Setting Lime Plaster Summarized

In bringing together all the data related to the work on quick-setting lime plasters, G. J. Fink, research chemist of the association, stated that 2,000 mixtures had been investigated, using 220 addition agents in varying amounts and combinations. The tests made usually consisted of time of set, workability and tensile strength. Note was taken over the period of hardening, of shrinkage, water absorption, etc. The plaster was taken to be satisfactorily hardened when it showed a penetration of 2 cm. of the Gilmore needle.

The classes of substances tried out as addition agents include: oxides, with especial reference to those of lead and iron; oxidizing agents, such as calcium hypochlorite; acids; various siliceous materials, including infusorial earth, asbestos, etc.; greases and oils; and finally such unclassified materials as phenol compounds, sulphite waste liquor and carbon black.

Several materials were found to increase the strength of the plaster. Portland cement, calcined gypsum, cryolite and calcium chloride are included in this list. Carbonates in general impart the same property, while lead acetate affects plaster in this way to a remarkable degree.

The results with regard to those materials that reduce the time of set indicate that cement clinker, calcium aluminate, or a combined addition of inorganic sulphate with carbon dioxide, gives greatest promise in bringing about the effect desired. While a plaster containing 25 per cent of cement required 21 hours 35 minutes to set, the time was reduced to 5 minutes by the addition of $MgSO_4$ and $CO_2$ in relatively small proportion. In some cases the acceleration brought about was so great that the use of a retarder was found to be necessary. Gypsum or sugar in small quantities was found to be most satisfactory for this purpose.

The following combinations were suggested as being most likely to yield satisfactory results upon commercial development: Lime and calcined gypsum; lime and portland cement; lime and calcium aluminate; lime and cement clinker; hydrated lime and ground quicklime; lime and an inorganic sulphate (with the possible addition of $CO_2$); lime and a dry silicate; lime and an inorganic carbonate; lime and a soluble aluminate; lime and cryolite; lime and a substance containing tannin.

## Lime in Agriculture

A bulletin, "Lime in Agriculture," has been prepared by the dominion chemist, Dr. F. T. Shutt, in response to many inquiries from Canadian farmers, respecting the application of lime and the relative merits of lime, ground limestone and other related substances. Dr. Schutt points out that there is a use and misuse of lime and that, unless rationally employed, the immediate advantages may be followed by decreased yields due to soil impoverishment. On the other hand, lime and carbonate of lime, if correctly used, are of much benefit, increasing crop production without impairing the soil's fertility. The author states that the exclusive and excessive use of the more caustic forms (quick and slaked lime) must inevitably lead to exhaustion of fertility, as they act as stimulants, setting free, but not adding to, the soil's store of plant food.

# Abatement of Industrial Stenches by Means of Activated Carbon

**A Review of Previous Efforts at Eliminating Industrial Stenches and a Description of an Installation Using Activated Carbon That Successfully Cured the Stench Nuisance in a Rendering Plant**

By Arthur B. Ray and N. K. Chaney
Union Carbide & Carbon Research Laboratories, Inc., Long Island City, N. Y.

THERE are many industrial processes which unavoidably give off objectionable odors or vapors. Many of us are familiar with the particularly obnoxious odors given off from the processes of rendering slaughter-house waste and other waste fats to recover tallow and have noted from time to time the publicity given to controversies between the health authorities and the operators of these processes. Other industries rather well known by reason of their odoriferous byproducts are the glue, fertilizer, soap, varnish and hide-treating industries. There are also numerous chemical plants which not only give out foul odors but in some cases more or less toxic vapors and gases.

In many cases, plants which give off particularly obnoxious odors and fumes are located in isolated sections as far away from habitation as possible. But obviously such an enforced isolation is rarely economical, so the operators of these plants have tried to satisfy the health authorities by various attempts at abating the nuisance.

**Industrial activity is egocentric and breeds forgetfulness and lack of consideration of the rights of others. Sometimes it becomes necessary for sluggish law to take a hand. So arose employers' liability and workmen's compensation. This other problem of industrial stenches has crept into that category too. Their economic elimination, whether on account of compulsion of law or as an expression of a more genial spirit, will be a great public gain. A technical problem that bears directly upon public happiness and comfort! This article discusses a suggested sclution of wide application and great promise. It is a significant signpost.**

Where these processes are operated and attempts are made to abate the nuisance, it is customary to cover or hood the containers and apparatus in which the processes are carried out, and by keeping a positive suction upon them by means of suction blowers to prevent the immediate dissemination of the objectionable odors and vapors. This protects the operators and persons in the immediate vicinity of the apparatus. The question then arises as to what disposal to make of the air laden with obnoxious fumes and vapors.

Various methods of disposing of this foul air have been suggested and tried. One of the simplest schemes is merely to pass the air into the tall stack from the boilers, the idea being that by mixing the foul air with the hot combustion gases from the boilers, some of the foul material will be destroyed and the rest disseminated in such a tenuous form as to cease to be a nuisance. Unfortunately, such a simple scheme does not satisfactorily solve the problem in the large majority of cases. Very little of the foul matter is destroyed in such a process and although the concentration is reduced, the nuisance is not abated, as many inhabitants of sections adjacent to rendering plants can and do testify vigorously. Putting the foul vapors into a stack really aids in their dissemination over wider areas.

Passing the air laden with foul matter through water sprays has been tried, but, except in certain cases where the objectionable matter such as acid fumes, etc., is readily soluble in water, this procedure is of practically no value. In some cases attempts have been made to mask or neutralize the foul odors given off from certain processes by injecting into the foul air a volatile material having a pleasant odor. Some of the volatile materials used are claimed to disinfect the air as well as mask the foul odors. In other cases, the foul air is passed over pots in which sulphur is burned or tar is boiled and thus is mixed with sulphur dioxide or tar fumes with the idea of reducing the obnoxiousness of the odor.

A recently developed process attempts to render the foul matters innocuous by causing them to react with chlorine. In the successful operation of this process, a careful adjustment of the proportion of chlorine and foul matter must be maintained, since either an insufficiency or an excess of chlorine is undesirable. It is obvious that such a process can be operated only under constant supervision. As a matter of fact, it was developed and intended to be employed in connection with large city garbage and waste disposal plants.

## An Activated Carbon Installation That Proved Satisfactory

It is evident, therefore, that the methods discussed are either ineffective or too complicated for general use. If a rendering plant, for instance, could not by these known means cease to pollute the atmosphere with foul odors when ordered by the health authorities to do so, it had no alternative but to shut down. This was the situation exactly when we were asked by the officials of a rendering plant to devise some means that would permit the plant to operate without disseminating

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the foul odors which had prompted the order to abate the nuisance or shut down.

It was an emergency, and we acted accordingly by hastily designing, with very little data to guide us, an installation which was rather crude from an engineering standpoint but which we thought would solve the problem. It did. The fumes and odors from the rendering kettles are caused to pass into a bed of activated carbon

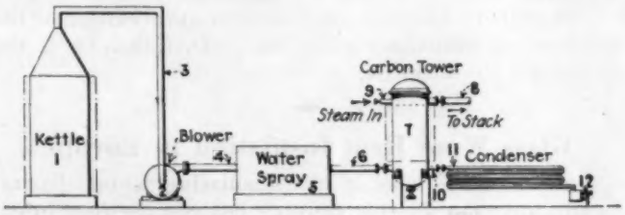



FIG. 1—DIAGRAMMATIC LAYOUT OF STENCH-ABATING INSTALLATION USING ACTIVATED CARBON

which absorbs them completely. When the carbon, after use for some time, becomes saturated with the impurities it is revivified *in situ* and used for another period.

After the erection of the installation in October, 1922, the plant officials and the town authorities expressed their perfect satisfaction with its operation.

### Type of Activated Carbon Employed

The activated carbon successfully used in the installation is a granular, highly activated coconut charcoal of around 8 to 14 mesh. This carbon is the best for the purpose because (1) it has a high absorptive capacity for odors and vapors; (2) it selectively absorbs the organic and odoriferous substances in preference to water vapor; (3) it is mechanically strong and so resists crushing and abrading action; and (4) it is relatively dense so that a minimum volume has a maximum absorptive efficiency.

### Operation of Installation

An elevation of the installation is shown in Fig. 1. Reference numeral 1 denotes a closed rendering kettle which is the source of the objectionable odors or fumes. Blower 2 draws the kettle fumes through pipe 3 and forces them through pipe 4 into chamber 5, where they are cooled by passage through a water spray. A draw-off pipe is provided at the bottom of this chamber and leads to a sewer. The cooled gases and fumes with or without drying then pass through pipe 6 to the purifying tower 7, which contains granular activated carbon. The gases from which all obnoxious matter has been removed by the activated carbon are then discharged in the air through pipe 8.

When it becomes necessary to revivify the carbon, it may be heated by any suitable means, but preferably by passing steam through it, to cause it to release the impurities it has taken up. In the installation shown, steam under 15 to 25 lb. pressure enters through pipe 9, passes downward through the carbon and out through pipe 10. The discharged steam is run to condenser 11 and the condensate trapped off into a sewer. Any uncondensed steam or other vapors and fixed gases are passed through pipe 12 into the firebox of the boiler used in generating steam for the plant or are otherwise readily burned under conditions to insure complete combustion. The revivified carbon is cooled by passing cold air or water through it and is then ready for re-use. If desired, the carbon may be dried by passing air through it while it is hot.

The details of construction of the carbon tower employed in the emergency installation are as follows: The cylindrical container of ¼-in. steel is provided with a horizontal partition in grid form in its lower portion. On the grid are placed a 4-mesh galvanized iron wire screen and a 20-mesh brass wire cloth to support the carbon. Similar screens are placed on top of the carbon to prevent particles of carbon from being carried upward by the ascending gas current. The top screens are weighted and freely movable so that they may follow the charge if it settles. Valves control the inlet and outlet of gases and are closed during the revivifying operation. Other valves control the inlet and outlet steam or hot water used in revivifying the carbon and are closed during the absorbing operation. A draw-off pipe with valve is also provided in the base of the tower. A 6-in. flanged pipe is provided for withdrawing the carbon at any time. The tower is jacketed with heat-insulating material to reduce radiation losses during revivifying operation. The tower as it appeared installed is shown in Fig. 2.

### General Principles Applying to Any Installation

It is obvious that the dimensions and details of construction of the carbon container and the general arrangement of the apparatus may be varied to meet the needs of a particular installation. The amount of carbon used and the depth of layer may be varied. A number of small towers may be used in series or parallel. The foul air may be sucked through instead of blown through. The foul gases may be cooled by passing through coils externally cooled by air or water. If cooled by passage through a water scrubber, the gases may be dried by passage through a drying agent such as lime or calcium chloride. It is pointed out, however,

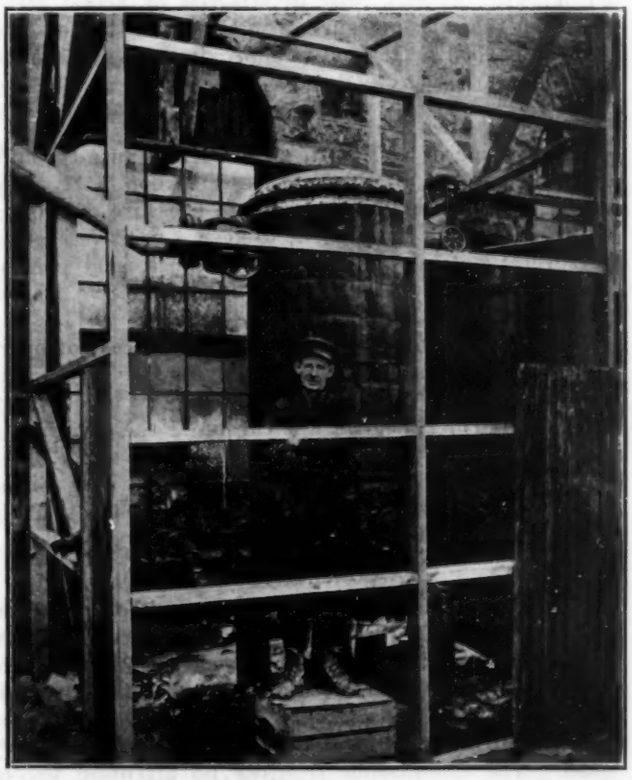


FIG. 2—ACTIVATED CARBON ABSORBER (CONTAINS 1,000 LB. OF GRADE 4 CARBON, 8-14 MESH)

that drying is not necessary, since the carbon selectively absorbs organic vapors and particles in preference to water vapor and will, therefore, effectively purify foul air which carries a large amount of water vapor.

The particular installation described was not designed for continuous operation, because the plant is not operated continuously. There is ample time at this plant for revivifying the carbon and getting it ready for re-use between the operating periods. However, if continuous operation is desired, the carbon tower may be duplicated and suitable connections and valves added so that one tower may be in operation while the carbon in the other is being revivified.

The length of time which the carbon may be in service before it becomes saturated with the foul substances and must be revivified will, of course, depend upon the amount of foul materials passed in per hour. The capacity of the carbon for absorbing and retaining the foul materials is very large. It will take up and retain more than 50 per cent of its weight of certain vapors. So, since the actual weight of foul materials in the air is usually very small, the carbon will remain effective for a considerable time. At the installation described, it has been the practice to revivify the carbon once a week, but the indications are that the carbon is not saturated by a week's use, and that the periods between revivifications could be longer.

### No Attention Necessary

The installation requires no attention during operation. The only power required is that necessary for the operation of the suction blower which keeps a suction on the kettles, etc., and which forces the foul air through the bed of carbon. The resistance of the carbon to the passage of air is of course dependent upon the depth of bed and volume of air passed per sq.ft. per minute. It has been determined by actual plant operation that the pressure drop through a bed of 8 to 14-mesh carbon 5 ft. deep is approximately as follows:

2.25 lb. when 75 cu.ft. per sq.ft. is passed,
1.25 lb. when 50 cu.ft. per sq.ft. is passed, and
0.5 lb. when 25 cu.ft. per sq.ft. is passed

The passage of 150 cu.ft. of air per minute through a cylindrical bed of 8 to 14-mesh carbon 5 ft. deep and 3 ft. in diameter will require a pressure of around 0.5 lb. This rate is sufficient to keep a positive suction on several vats or kettles, for instance, and can be obtained by the use of a small Roots positive blower or other suitable blower.

The total cost of operation includes the cost of operating the pressure blower, supplying, if necessary, cooling water to cool the air and vapors before they enter the purifier, heating the carbon in the revivifying process by introducing steam or hot water or by other means, and cooling the carbon by passing cold air or water through it. Without going into details, it is obvious that the total operating cost is very small.

### Conclusions

We have demonstrated that industrial stenches can be effectively abated by the use of a simple installation employing activated carbon as the absorbing medium. Highly activated granular coconut charcoal is the type of carbon successfully used. The original cost of the installation is not large and the operating cost is very small. The installation requires no attention except during the periodical revivification, which is carried out by simply heating the carbon *in situ* by steam or other means. The signal success of the installation now in operation leads us to believe that the principles employed in this case may be applied to solving similar problems at other plants and may be of real value to those industries which are so unfortunate as to have obnoxious fumes and odors for disposal. With such an installation available, there is no reason why any industrial process should be operated so as to pollute the atmosphere with foul odors.

The authors desire to express their appreciation of the engineering assistance given by H. D. Edwards, of the Linde Air Products Co.

## Glass Wool Heat Insulation in Europe

Data on glass wool, a heat-insulating material practically unknown in this country but coming into intensive use in Europe, are given by A. D. Saborsky in an article in the May, 1923, *Journal of the American Ceramic Society*.

In the first machines developed for the manufacture of glass wool, the tips of a number of horizontal glass rods were melted by rotating them in gas flames and the drops thus formed were carried to the surface of a revolving drum upon which the threads of glass were wound. Breaks had to be renewed by an operator, of course, and the obvious improvement of supporting the rods vertically so that the threads would be self-renewing was delayed for a long time. The high cost of thin rods next directed efforts toward the use of scrap glass as raw material, and the present method is to melt scrap in a tank provided with a number of small openings in the bottom through which the glass flows to form threads which are wound up as before on drums. Drops are thrown off by centrifugal force so that only light wool accumulates on the drums. To insure steady flow, the openings may be heated with individual electric coils, or air pressure may be put above the molten mass. In a factory under construction in Dresden, Saxony, every furnace will feed three vats of 200 openings each. From present production figures it is estimated that about 6,500 lb. of wool will be produced in 24 hours. The help required would be two spinners, one melter and one helper per furnace, which would result in an output of almost 70 lb. per man-hour. The fuel consumption is 32 cu.ft. of artificial gas per pound of wool. Glass wool insulation is selling for 12c. per pound and the writer estimates the manufacturing cost at about 2½ to 3½c. per pound.

The product is cut off the drums, carded and loosened up by hand. It weighs about 13.8 lb. per cu.ft. as against an average of 156 lb. for solid glass, so that it contains approximately 90 per cent dead air cells by volume. It may be exposed to temperatures far above the melting point of the glass when used in insulating very hot pipes—for example, the exhaust pipes of heavy oil engines—and the only effect will be the baking or melting of a ⅛- or ¼-in. layer directly in contact with the heated surfaces, the rest of the wool being unaffected.

Glass wool may be applied in several forms, the most common being bands ⅛ to ½-in. thick and 2 to 10 in. wide. Larger pipe line and other objects are often insulated by first surrounding them with coarse wire mesh in a position representing the outline of the finished insulation. The space between is then simply stuffed with the wool. For locomotives, boilers, etc., where the insulation has to be removed periodically, mattresses are formed between two templets of fine wire mesh.

# Co-ordinating Colloid Data

## First National Symposium on Colloid Chemistry at University of Wisconsin Affords Opportunity for Interchange of Views

FROM MANY ANGLES, the Symposium on Colloid Chemistry held under the auspices of the University of Wisconsin at Madison June 12 to 15 was unique among scientific gatherings in this country. Forces of attraction brought into play by the interest taken in colloid chemistry at Wisconsin and the presence of Professor Svedberg drew together more than a hundred enthusiasts normally dispersed throughout the country. For 4 days the theories and facts of colloids were discussed without interruption. Papers for the program had been carefully chosen and ample time was given for presentation and discussion, points that contributed in no small measure to the great success of the meeting. Papers were limited to 40 minutes, but discussion was unlimited and in many cases exceeded the time of presentation. It was recognized that one of the most valuable features of such a gathering lies in the free exchange of views among men of varied experience. The symposium attracted engineers and biologists as well as men interested in plastics and in agriculture, and the important thing is that each was able to help the other. In addition, there were the stimulating criticisms and suggestions by Professor Svedberg.

The University of Wisconsin is planning to publish the papers and all the discussions as a special monograph, copies of which may be reserved by notifying Prof. J. H. Mathews, chairman of the department of chemistry, University of Wisconsin. Further recognition of the important start made by Wisconsin is to be found in the decision of the colloid committee of the National Research Council to hold a second symposium next June at Northwestern University.

From what has been said it should not be inferred that the weighty deliberations precluded social features. Madison affords most delightful natural surroundings for such a gathering and the Wisconsin hosts provided an automobile excursion, launch ride, picnic supper and other entertainment. The total attendance was about 250.

Turning to the technical program, this was opened by Professor Birge of Wisconsin, who expressed the hope that through such meetings it might be possible to co-ordinate and simplify the facts of science, which are increasing at such a rapid rate. The papers presented are given in abstract in the following paragraphs:

### Properties of Sols and Gels

Studying the thermochemistry of sulphur sols, F. L. Browne found that the heat effects of coagulation of colloids are due to interaction of ions, not to energy changes accompanying the changes of aggregation. Accurate measurements were made with an adiabatic calorimeter with NaCl, KCl, $MgCl_2$ and $AlCl_3$. They are particularly interesting because they are reversible. With NaCl a greater heat was observed on partial coagulation than on complete coagulation. With $AlCl_3$ no heat was evolved on coagulation for either large or small particles.

A study of precipitation of sols by alcohol led Prof. W. D. Bancroft to suggest that our values for the single potentials of metals may be in error by as much as 0.7 v. in certain cases. Dr. Bancroft and J. B. Nichols also noted that camphor peptizes pyroxylin and has no effect upon its freezing point unless water is present.

H. N. Holmes advanced the "brush heap" structure for gels. An analogy is the "false gel" found by the crystallization of 4 per cent caffein from water, giving a mass of interlocking crystals and water which can be inverted without flow of the liquid. The fibrous structure of cotton still exists in guncotton and can be observed by precipitation with alcohol. Various methods of making gels were illustrated. A new silica gel precipitated by nickel chloride was found to adsorb 100 per cent of its weight of benzene vapor. This paper was followed by an experience meeting on gels. Later in the week H. B. Weiser outlined the factors influencing the formation of inorganic jellies. Coagulation

at proper rate was found to be important, although the H-ion concentration was not. In the majority of cases it is beneficial to mix cold and then raise the temperature.

### Demonstration of Colloid Technique

Recent advances in colloid chemistry have been made possible by improved apparatus and technique, factors that were demonstrated Tuesday afternoon by Prof. The Svedberg. The ultra-microscope, sedimentation and deposition of gold on small colloid particles as nuclei are used in determining particle size. Distribution curves are established by the sedimentation balance and by photography. Shape is studied by X-ray methods and by polarized light. The charge on proteins is determined by cataphoresis experiments, using their fluorescence in ultra-violet light to follow the moving particles. A recent improvement in electrical methods for preparing colloids consists in inclosing the arc in a quartz tube and blowing through nitrogen. Professor Svedberg's apparatus was shown on slides and after the meetings his researches at the university were described in the laboratories.

Problems of adsorption from the standpoint of catalysis were considered by Prof. H. S. Taylor. The heat of adsorption of hydrogen on nickel is calculated to be 13,000 calories, a value which agrees with calorimetric measurements. Since the heat of vaporization is 450 calories, something more drastic than liquefaction must occur during adsorption.

R. E. Wilson called attention to the importance in lubrication work of studies on solutions which give abnormal surface tensions and whose surface films may be considered as plastic solids.

It was pointed out by E. F. Burton that the Helmholtz double layer is not applicable to colloid systems in general, since the particles are charged and do not come in contact with one another. For concentrated colloid systems the calculation of Avogadro's number is not valid, because the particles exert a force on one another which is not considered in the equation. Charges are neutralized and Brownian movement slowed down before coagulation.

A new theory of emulsification was enunciated by Prof. J. Hildebrand. Emulsifying agents form a monomolecular layer at the interface with the polar part in the water and the non-polar part in the oil. The relative atomic volumes of the two parts determine the radius of curvature, which in turn determines whether the water or the oil is to function as the dispersed phase.

### Lively Discussion on Protein Behavior

Thursday's program on protein behavior and allied subjects brought out some lively discussion, particularly that on the ionic theory which followed J. A. Wilson's review of the applications of the Donnan equilibrium. Other papers included were those of Dr. J. Loeb, on the relation between various properties and the H-ion concentration; J. H. Mathews and B. W. Rowland, on calorimetric studies to determine whether protein behavior on the addition of electrolytes is due to chemical action or adsorption; M. H. Fischer, on the theory of lyophilic colloids; David Klein, on the conditions necessary for the commercial production of enzymic and animal glandular products; I. I. Ostromuislenskii, on the relation of colloid chemistry, particularly adsorption, to medical therapy; A. W. Thomas and Lucille Johnson, on mutual precipitation which is caused by chemical reactions between ions adsorbed on the surfaces of the oppositely charged particles. R. H. Bogue discussed the conditions affecting the hydrolysis of collagen to gelatine. Digestion of various hides at different temperatures and different $p_H$ values, followed by analysis for free amino groups throws light on the mechanism.

**In any field where a large number of workers are pursuing various lines of endeavor, nothing is more conducive to real progress than an occasional opportunity for free exchange of ideas. Such an opportunity was afforded those interested in colloid chemistry by the symposium on this subject held under the auspices of the University of Wisconsin and the results have so far exceeded even the most optimistic expectations that a second symposium has been arranged for next year. Accordingly, we may predict a rapid yet co-ordinated development of colloid chemistry in this country, a development which will reflect great credit upon the forward-looking originators of this plan.**

Of the papers presented on Friday, that of Jerome Alexande is already familiar to our readers through the series of articles on the "Colloidal State in Metals and Alloys" published in *Chem. & Met.* from Jan. 11 to Feb. 1, 1922. E. B. Spear discussed the many phases of the rubber colloid system, the influence of compounding ingredients on physical properties and milling studies made possible through rapid acceleration at low temperatures.

Experiments on photographic behavior were reported by S. E. Sheppard. Photographic emulsions of identical grain distribution behave differently. Svedberg's method of determining the percentage of developable grains has been of great service in this field. The development nuclei are scattered at random and it is important to know whether or not they exist prior to exposure, and if so, whether they are all of equal sensitivity. Apparently the nuclei are colloid particles distributed through the halide crystal rather than crystals distributed through the colloid gel. It is impossible to distinguish between the classical theory and the quantum of light from these experiments.

Agricultural applications were considered by R. Bradfield and R. A. Gortner.

## Hardness of Very Hard Steel

An attempt has been made by the Bureau of Standards for the past 3 or 4 years to obtain a very hard steel ball which will carry the load of 3,000 kg. in a Brinell testing machine when working on very hard metal, but up to the present without success. Tungsten carbide has been suggested, but it has been impossible to obtain this material in suitable condition in either this country or Germany. Recently a very hard vanadium steel made at the bureau's laboratories has been tried and shows promise of success.

# Steel Treaters Meet at Bethlehem

**Regional Meeting Well Attended—Toughness of Steel Measured at Normal and Low Temperatures—Cracking and Bursting of Steel Tools Thoroughly Discussed—Comprehensive Study of Case-Hardening Practice**

EDITORIAL STAFF REPORT

ANOTHER very interesting and successful meeting was held by the American Society for Steel Treating, at Bethlehem, Pa., June 14 and 15. Participating in this gathering were all the local organizations in the Eastern states, which sent about 100 of their members to enjoy the technical sessions and the inspection of the Bethlehem Steel plant. Five important papers were presented and discussed; space limitations permit us to summarize but three of these.

## BRITTLENESS OF COLD METAL

Dr. F. C. Langenberg and his co-workers at the Watertown Arsenal have been engaged in a lengthy investigation of the impact strength of several steels, when tested at temperatures ranging from 80 deg. below zero, F., to 1,000 deg. He presented an account of this investigation as far as it compared the impact strength of steel at normal and cold temperatures. This is a matter of considerable importance. The behavior of rail steel and railroad axles in very cold weather has been exhaustively studied, but it is seldom realized that motor cars or trucks may be called upon to resist heavy shocks in the coldest weather, or that airplanes may hop off on a hot summer day and rapidly mount to a subarctic temperature.

A large Charpy impact testing machine was used. Specimens 3 cm. square with the usual round-bottomed notch were broken. Temperatures from 0 deg. to 50 deg. F. were obtained by working with windows open in winter; lower temperatures were had by immersing the sample in an acetone bath, to which $CO_2$ snow was added. When the specimen had maintained the desired temperature for some time, it was withdrawn quickly and tested; the operation required about 10 seconds, and the temperature of the specimen changed no more than ½ deg. F. during that time.

In general it is found that the impact resistance of steels, both annealed and heat-treated, is very low at low temperatures. With rising temperature, however, there comes a range when the toughness increases very rapidly, and at 200 deg. C. most of the steels that were heat-treated attain their maximum toughness. Annealing generally increases the brittleness at low temperatures, and the piece has small toughness until tested at a materially higher temperature than the same steel when heat-treated. This is only another demonstration that alloy steels should not be used except in the heat-treated condition. Or, said in another way, coarse-grained, banded ferrite will give considerably lower impact than finely disseminated ferrite.

A nickel-chromium steel (S.A.E. 3220) and a carbon steel (S.A.E. 1020) used for case-hardened parts and heat-treated to give the conditions existing in a toughened core, are compared as follows:

| Temperature Deg. F. | Steels No. S.A.E. 3220 | S.A.E. 1020 |
|---|---|---|
| —60 | 420 | 273 |
| —40 | 450 | 400 |
| 0 | 470 | 800 |
| +50 | 590 | 960 |
| 110 | 650 | 1,030 |

The alloy steel has higher impact resistance at low temperature, but the relation reverses at summer heat (although the carbon steel gave very erratic results under test). The alloy steel is varying in toughness at a rapid rate at room temperatures, so it is necessary to control this item in routine tests if they are to be consistent.

Medium carbon 3½ per cent nickel steel (S.A.E. 2335) and chromium-nickel steel (S.A.E. 3240) have quite similar impact properties when heat-treated; the latter, however, registers 230 ft.-lb. at —80 deg. F., considerably higher than the gun steel.

## WHY DID IT CRACK?

A discussion of that ever-present question "Why did it crack?" was presented by F. R. Palmer of the Carpenter Steel Co. in his paper, "Equalization of Internal and External Strains in Tool Steel." Starting from the evident proposition that a steel cracks when the total of the internal and external strains exceeds the strength inherent to that piece of steel, he showed how many occurrences during manufacture of a tool cause cumulative internal stresses of unsuspected magnitude.

First, the steel may be defective when it leaves the maker—containing either internal bursts, pipe or segregated impurities. Such occurrences have happened. The chief danger here is the "internal notching" effect, which causes concentrations of stress in the region of the defect many times the average across the entire section. Such defects can be made apparent by cutting off a slab and pickling it in 1:1 HCl.

Second, even the best steel can be destroyed by a poor designer. Especially should he avoid sharp corners at the root of notches and keyways. Re-entrant angles and unbalanced sections (heavy masses adjoining light wings) are sometimes necessary, but then the designer must make every effort to relieve the stresses by proper proportioning of adjacent parts.

Third, the act of machining puts strains into the surface layers of the steel, especially if the cutting tool is not in first-class condition or is overworked.

These three effects may be cumulative and at times will crack the tool before it gets to the hardening bath. But if any tool is the least suspicious, it should be carefully annealed to relieve the internal stress as much as possible, so as to enter the hardening furnace in the best possible shape.

Hardening practice unavoidably introduces very severe strains in the metal. To minimize the danger, heating should be slow and uniform so the entire tool will expand at the same rate; special care should be exercised when passing the critical range, where a sharp contraction in volume occurs. In quenching it is obvious that heavy thermal and transformational stresses must occur, and it should be apparent that the steel must be in the best condition to withstand the punishment, if disaster is to be averted.

When judging temperatures by eye, the tendency is

to overheat the steel. With pyrometric control, the operator is more often likely to withdraw the piece before it is hot enough. Water-quenched tools, cracked after underheating, have a quite characteristic appearance: the corners shell off and the piece parts along a surface which apparently was at equal temperature. The shelled-off corners are file-hard, with good fracture, smooth and fine grained; the core, however, never having been through the critical range, is coarse grained and soft.

Appearances of cracked oil-hardened tools are somewhat different. If the steel is defective, the crack usually runs along the bar, following a segregated streak. If cracking is due to poor design, the cracks are regularly found in certain places and have regular directions and similar depths. If the tool shatters into a number of fragments it is usually a poorly hardened tool, reheated at too rapid a rate. Such a failure is an exaggerated grinding crack. The cracks originate during heating and oxidize, then split further during quenching. Such ruptured surfaces are partly oxidized, partly clean.

But suppose the tool to withstand successfully the quenching operation; it is obvious that the drawing operation should immediately proceed to remove as much of the internal strain as possible without removing any more of the hardness than necessary. A long, low draw is the way to effect this desired end. The maximum amount of softening caused by a tempering heat occurs in 15 minutes; it takes 5 hours or more to relieve quenching strains—draws of indefinite length do not damage the quality of the piece.

If any straightening is done, it should be done immediately after the drawing operation, while the metal is still warm. Any damage to the elastic properties caused by the overstrain of a straightening press will then correct itself while the metal is cooling. If cold straightening must be done, the damage to the elastic properties may be cured by a short stay in boiling water.

Finally, a perfectly sound tool may be cracked during grinding. Here Mr. Palmer distinguished two types of troubles, grinding checks and grinding cracks. Checks are only a few thousandths deep and are caused by too rapid grinding or rubbing against a dirty, dull wheel. (Wheels are rapidly fouled if they are working on pieces the skin of which has been decarbonized during heat-treatment.) Grinding cracks, however, are much deeper, and represent the deepened check which opens up in a badly strained tool.

### Study of Carburizing

An exhaustive study of the carburizing process was presented by B. F. Shepherd, of the Ingersoll-Rand Co. Since a considerable portion of their carburized work goes into air hammers and drills where it must resist not only wear but very violent and repeated shocks, it is clear that their metallurgists must be able to control that hardening operation within close limits. Their general practice is to avoid the use of carbonized pieces if the part can be made satisfactorily of heat-treated alloy steel, despite the fact that it may be cheaper to machine the softer steel, carbonize and harden. Since carbonizing is a process that may be expected to magnify any defect in the original steel, it is good practice to keep the number of analyses at the minimum, obtain from the manufacturer whose metal gives greatest uniformity, and to inspect rigidly upon receipt of shipments.

Several different steels of first quality and analyses usually put into carburized work were studied by Mr. Shepherd, varying the type of cement, the time and the temperature. Carbon penetration was determined by analyzing successive shells, carefully machined from the surface. Most of the samples were carbonized 24 hours at 1,600 deg. F. The results were presented in a series of diagrams, and only the most general conclusions can be noted here.

### Properties Which Should Influence Selection of Carbonizers

In general, it may be stated that a light compound and one which does not settle when packed is desirable, since it is sold by weight but used by volume. During heat, the compound should shrink very little, and quite uniformly. To avoid discomfort to workers and clogging small openings in the metallic pieces, the material should be reasonably free from dust. It should not be too heavily "energized," since such a compound will damage the finish of machined steel. Its thermal conductivity is always low, but the higher it is the less time is required to bring the work to heat.

Home-made carbonizers of wood charcoal and $BaCO_3$ are not to be recommended for miscellaneous work. Their shrinkage is high, they pack badly, and are very dusty and dirty. If they must be used, it will be found that a mixture with 40 per cent carbonate gives no better results than a much lower proportion.

Service is the real test of carbonized work; routine tests are quite indirect. Samples from each heat should be broken in a standardized manner and the depth of case and refinement of grain noted. Files and scleroscope may be used to test the hardness—the standard Brinell requires too much metal to be applicable to carburized work. Sclercscope tests are usually quite high until the carbon drops to 0.50 per cent. File tests vary with the files, the method of testing, and the operator, but notwithstanding this, file testing is the usual method.

Soft spots on hardened carburized pieces may be due to many causes. In good work on first-class metal they are quite rare. Mr. Shepherd said they had observed a few examples of the "abnormal structure" of carburized, unhardened metal, described by E. W. Ehn, of Timken Roller Bearing Co. and blamed upon oxidized metal. However, such abnormal structures as had been found at the Ingersoll-Rand plant hardened perfectly and uniformly.

## Testing of Molding Sand

In the issue of *Chem. & Met.* for May 14, 1923, page 860, a report of the Foundrymen's meeting at Cleveland contained some misinformation on the testing of molding sand. It is reported that R. E. Kennedy of the University of Illinois reported these tests to the meeting, but as a matter of fact the gentleman who spoke was H. B. Hanley, chairman of the subcommittee on tests. Furthermore, the quoted dimensions of the molding box are in error. Mr. Kennedy informs us that the box finally recommended by the testing committee is designed to give a bar 2 in. wide and 16¾ in. long, while the height varies according to the amount the sand compresses after uniform ramming.

# What Is the Future of the Mixed Fertilizer?

## Use of High-Analysis Mixtures Held to Be Sound Policy in General Farming and a Most Effective Supplementary Means of Increasing Crop Yields*

BY FIRMAN E. BEAR†
Agronomist

THERE is rather general agreement among those who have given consideration to national problems that increases in the acre yields of crops are essential to our welfare. That the use of a well-chosen mixed fertilizer will result in a marked increase in the productive capacity of almost any soil which has been under cultivation for 25 years or more has been amply demonstrated by experiment station tests. Even in Liebig's day the effects from the use of his chemical manures "excited the wonder of all who passed by." That the manure, clover, limestone and phosphate program can be made equally effective is not questioned. The fundamental error in many men's conception of the problem of unproductive soils lies in their assumption that its solution lies in the adoption of some *one* system of soil management. Undoubtedly it lies in the supplemental use of *several* systems, sometimes more of one, at other times more of another.

### MEASURING FERTILIZER EFFECTIVENESS

A complete fertilizer is usually more effective in increasing crop yields than is acid phosphate or any other single ingredient of the fertilizer when used alone. This is rather generally accepted as a fact and is supported by a large amount of experimental and circumstantial evidence. Choosing an example from the long-continued and carefully conducted field tests on the experimental farm at Wooster, Ohio, the following data are presented as being of interest in this connection:

EFFECT OF FERTILIZERS ON CROP YIELDS—WOOSTER SILT LOAM SOIL

Rotation—Corn, Oats, Wheat, Clover, Timothy. Twenty-five Year Average Acre Yields, 1894-1918.

| Fertilizer Per Rotation | Lb. | Corn, Bu. | Oats, Bu. | Wheat, Bu. | Clover, Cwt. | Timothy, Cwt. |
|---|---|---|---|---|---|---|
| None | 0 | 28.0 | 32.0 | 11.4 | 16.3 | 25.4 |
| Acid phosphate | 320 | 35.5 | 42.0 | 19.6 | 22.3 | 30.6 |
| Muriate of potash | 260 | 33.2 | 35.4 | 12.6 | 19.4 | 27.9 |
| Nitrate of soda | 480 | 33.2 | 36.1 | 13.3 | 20.8 | 29.6 |
| Phosphate-potash | 580 | 43.7 | 44.9 | 20.9 | 25.9 | 30.7 |
| Complete fertilizer | 1,060 | 46.8 | 51.2 | 28.1 | 29.8 | 34.5 |

It is not a difficult matter to find objections to such a type of experimentation if its purpose is that of determining directly what the fertilizer practice should be. On the other hand, it is difficult to decide upon some scheme of field experimentation that will satisfy the requirements when one takes into consideration the fact that the economic factors involved are constantly changing. If the cost of each ingredient in the complete fertilizer continued to bear a constant ratio to the total cost of the fertilizer and if the selling prices of crops remain the same, the problem would be relatively simple. Yet even then it would be necessary to have in mind that if the productivity of the soil is increasing as a result of the fertilizer treatment the analysis that gave the best return per acre when the test was initiated would not be likely to be the one that would be the most effective 10 years later. The very exactness with which the experimental field test is repeated each year defeats in part the purpose for which it is ordinarily intended. The soil is dynamic and not static.

### FLEXIBLE FERTILIZER PRACTICE

Having these points in mind, it seems desirable to examine somewhat carefully another type of field comparison of fertilizers in which the quantities and analyses applied are more in keeping with what experimental as well as circumstantial evidence indicates to be good fertilizer practice. Such a comparison is also available at Wooster, having been begun after some years of study of the results obtained from the tests previously mentioned. The data follow:

COMPARISON OF EFFECTIVENESS OF VARIOUS FERTILIZER ANALYSES

Corn, Oats, Wheat, Clover Rotation—Wooster Silt Loam Soil. Eight-Year Average Acre Increases From 1,000 Lb. of Fertilizer.*

| Analysis | Corn, Bu. | Oats, Bu. | Wheat, Bu. | Clover, Cwt. |
|---|---|---|---|---|
| 0-16-0 | 9.2 | 2.5 | 7.2 | 6.1 |
| 0-12-4 | 10.0 | 6.5 | 7.7 | 8.3 |
| 2-8-2 | 11.0 | 2.4 | 11.6 | 4.7 |
| 2-12-2 | 12.9 | 4.8 | 13.6 | 8.6 |
| 4-8-4 | 13.1 | 4.1 | 12.7 | 7.9 |
| Unfertilized yield | 55.3 | 51.5 | 24.0 | 39.7 |

* Fertilizer applied half on corn and half on wheat.

The soil was in a fairly high state of productivity, as indicated by the average yields on the unfertilized plots. The rotation included clover once in 4 years and enough limestone was applied to prevent its lack from being a limited factor for this crop. Comparisons were made among equal weights of the several analyses used in the tests. In almost every case the mixed fertilizers produced larger increases than the acid phosphate alone. Of the list employed, the most effective analysis seemed to be the 2-12-2.

The thing that impresses one most in the Wooster data is the fact that the increases in yield with the 2-12-2 fertilizer were so much larger than they were when the acid phosphate was used alone. Does it not seem remarkable that one can take 4 per cent of phosphoric acid out of a fertilizer, substitute for it an equal percentage of ammonia and potash and raise the increase in yield of corn 40, of oats 92, of wheat 89 and of clover 36 per cent? Figuring these increases on the basis of weighted averages according to the Dec. 1 farm prices for the period 1912-21, the increase for the rotation from the use of the 2-12-2 over the acid phosphate alone is 63 per cent.

It might be argued that the conditions of the test were not fair. The clover crop was not plowed under; no manure was applied. With reference to the former it is my opinion that the plowing under of clover at any

*From a paper presented before the meeting of the National Fertilizer Association at White Sulphur Springs, W. Va., June 12-14, 1923.

†Professor of Agriculture, Ohio State University, Columbus, Ohio.

place east of the Mississippi River, and before long even west of it, is not good business. What is the logic of growing a crop to plow under except as this is made necessary in intensive systems of farming where livestock cannot be kept? With reference to manure requirements for high yields should be satisfied with acid phosphate, limestone and the frequent growth of legumes. But supposing the field hasn't had manure! It is now time to plant corn or sow wheat! Shall we suggest the use of acid phosphate or of a well-chosen mixed fertilizer?

The low state of productivity of a considerable percentage of the land east of the Mississippi River is due to certain economic conditions which have obtained over which farmers have had no control. As a result of the demoralizing effect of the Civil War the farmers of the South have had more or less of a hand-to-mouth existence. Meanwhile farmers in the Eastern states have found themselves in competition with millions of acres of virgin farm land in the West which are being exploited for their resources. As a result of these conditions we are approaching what may be termed a "national soil emergency condition." In overcoming this emergency condition complete fertilizers rightly used have been found to be a valuable aid. By the time their use for this purpose is no longer required, the more intensive systems of farming now practiced in the Eastern states will have spread over most of the area east of the Mississippi River and the need for complete fertilizers will be greater than ever.

**There is nothing fundamentally wrong with the practice of using high-analysis mixed fertilizers. Every one of the analyses included in the Ohio Standard Dozen and in the similar lists suggested by agronomists of other states will be found to be a good investment on most of the land which has been under cultivation for 25 years or more. Fertilizers are not intended to take the place of manure and clover on a livestock farm. But as long as they can be used with additional acre profit, why not use them? The mere fact that they have been misused cannot be construed as any very legitimate argument against the mixed fertilizer.**

The arguments against the 2-8-2 and other low grades as well as low-percentage analyses no longer apply. No intelligent farmer need buy anything but high-analysis fertilizers, made up of materials of known availability. If the farmer desires or should move in the direction of more intensive livestock farming and a bigger and better manure program, why not suggest that he may be able to "arrive" more quickly by the use of a complete fertilizer? Of course a 2-12-2 will not supply an adequate amount of nitrogen to satisfy alone the needs of large yields of crops, but if by its use the farmer can get a greater acre profit, leave a larger amount of crop residue in and on the soil and at the same time produce more manure to return to the soil, why shouldn't he use it?

The question might be raised as to whether we have any guarantee that the 2-12-2 on the market will duplicate in its effect the 2-12-2 of the experiment stations. There is still abundant opportunity for manufacturers to use organic ammoniates of low availability in their 2-12-2 and lower analyses. However, each year finds more of the control chemists "checking up" the availability of this organic nitrogen. If the National Fertilizer Association desires to rid itself of a large share of the criticism that still is directed against complete fertilizers, we commend for its consideration the following proposal regarding the nitrogen in mixed fertilizers which might well be embodied in a resolution to be presented to the Association of Official Agricultural Chemists at its next annual convention:

> The active water insoluble nitrogen *found* must be equal to or greater than the inactive water insoluble nitrogen *found*, as determined by the alkaline permanganate method of the A.O.A.C., unless the percentage of water-soluble nitrogen is equal to 70 per cent or more of the total *guaranteed* if the fertilizer is to be *passed*.

Fortunately the ratio of the organic to the total ammoniates decreases with the increased consumption of fertilizers. Furthermore, a larger percentage of the organic carriers are being acidulated. There is reason to believe that acidulated ammoniates contain their nitrogen in as available a form as that of dried blood or perhaps sulphate of ammonia. The comparison of the commercial 2-12-2 and the experiment station 2-12-2 is reduced therefore largely to a comparison of sulphate of ammonia and nitrate of soda as carriers of nitrogen.

The opinion, based on the experimental work of Wagner, later supplemented by that of Wheeler and Hartwell, is that sulphate of ammonia has an availability on limed soil of 90 as compared to 100 for nitrate of soda. Comparative trials on the Ohio Experiment Station farm at Wooster, on limed soil, the data for which are given below, indicate for sulphate of ammonia as a relative effectiveness of 70 on corn, 53 on oats, 80 on wheat and a residual effect of 69 on clover and 55 on timothy as compared to 100 in each case for nitrate of soda. The weighted average for these crops based on relative Dec. 1 prices for the years 1912-21 would be about 70.

COMPARATIVE EFFECTIVENESS OF VARIOUS CARRIERS OF NITROGEN

Soil Limed and Treated With Phosphate-Potash Mixture*
Increase from Nitrogen Calculated on Basis of Nitrate of Soda at 100.

| Carriers of Nitrogen | Corn | Oats | Wheat | Clover | Timothy |
|---|---|---|---|---|---|
| Nitrate of soda | 100 | 100 | 100 | 100 | 100 |
| Oil meal | 69 | 61 | 43 | 27 | 31 |
| Dried blood | 61 | 44 | 49 | 41 | 19 |
| Sulphate of ammonia | 70 | 53 | 80 | 60 | 55 |

* The analysis of the mixture after the addition of the carrier of nitrogen was approximately 4-7-13. This was applied at the rate of 980 lb. per acre per rotation and distributed among the first three crops.

We must admit that the substitution of sulphate of ammonia and of organic ammoniates for nitrate of soda in a fertilizer tends toward a reduction in efficiency. This is true at the rates in which fertilizers are applied in general farming. It may not be true when large amounts are used, but probably in the latter case applications of the most available carriers of nitrogen from time to time through the season rather than in one initial application are to be preferred. On the other hand, it must be kept in mind that the farmer has a much better opportunity to make a profit from the use of fertilizers than the experiment station data indicate. An important reason for this is that he can vary his fertilizer from year to year or from crop to crop to fit the need, a thing which cannot be done in the fertilizer tests.

# Equipment News

Machinery and Appliances for Production and Control

***From Maker and User***

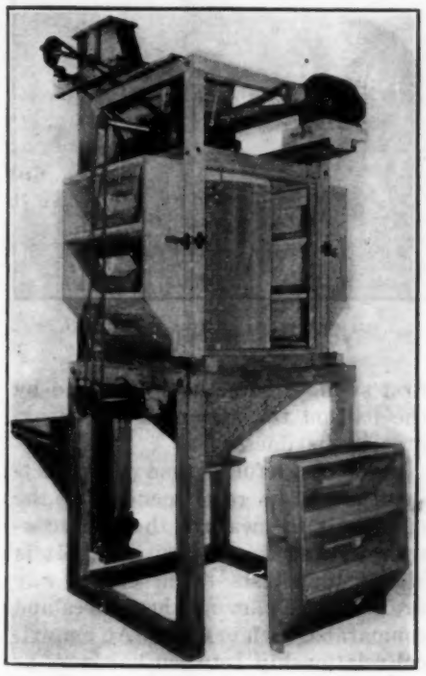
Materials and Accessories for Chemical Industries

## New Bolting Reel

A machine that will sift finely powdered materials through a fine mesh, will at the same time aërate them, will prevent separation of the lighter and heavier ingredients and has a continuous large capacity is presented in the new vertical bolting reel made by the J. H. Day Co., Cincinnati, Ohio.

This reel has a vertical cylindrical bolting drum, inside of which are placed a series of disks and a fan. The shaft revolves at 1,200 r.p.m. The feeder, which is on top of the machine, allows the material to fall evenly upon these disks and the air current created by the fan blows the material through the screen.

A brush is caused to revolve inside of the screen against the surface of the mesh, thereby keeping it free from an accumulation of material. Around the screen is an expansion chamber inclosed by four doors. These doors are covered with muslin, which permits part of the air to pass out but retains the sifted material. This material slides down inclined surfaces on the doors and falls into the hopper below the screen. The majority of the screened material falls directly into the hopper. On the bottom of the hopper is placed a cylinder which acts in two capacities—one half of this cylinder is used to catch the dust from the air circulation between the outside of the sifter drum and inside and is connected to a cylindrical dust collector at the bottom, which has a spiral conveyor in the middle. All air passing through this drum and against the baffles in it deposits the dust in suspension, and it is conveyed to the discharge hopper. The material which falls to the middle of the cylindrical chamber, however, is carried by a conveyor running in the opposite direction to the tailing discharge. The air that passes through the muslin in the doors is replaced by air coming in through the intake, thereby reclaiming as much as possible of the material in suspension. A can or other container may be placed under the discharge valve and the sifted material removed from the hopper, if desired. This connection can vary, depending upon the installation requirements.



THE DAY VERTICAL BOLTING REEL

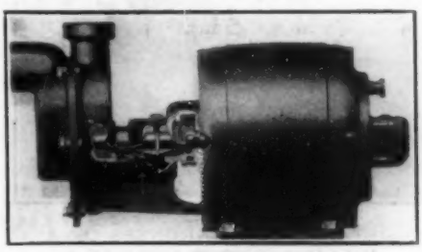
From the above description it can be seen that within the walls of this machine is a complete unit, capable of automatically feeding material into the sifter, accumulating all of the sifted material in the hopper, and discharging the material into a container. The advantages of this machine lie in the fact that the material is passed through the screen by the action of an air fan instead of by the ordinary method of gravity or vibration. The material is given a gyratory motion and is blown through the screen, which is stationary, around a cylindrical drum. It provides a continuous operation, which is very essential for large capacities. The capacity of this machine is four or five times greater than that of the ordinary bolting reel; it occupies less floor space and is very efficient in operation. These machines are motor driven from the top and the operation is comparatively quiet. It aërates the powder, thoroughly blending any materials of lighter or heavier density, and will even operate successfully where slight traces of moisture are present. The material passing through the screen has the appearance of a cloud, and the sifting of all powders can be taken care of.

A few of the users of this machine are: Pompeian Co., Cleveland and Toronto; the Armand Co., Des Moines, Iowa; Potter Drug & Chemical Co., Malden, Mass.; Andrew Jergens Co., Cincinnati, Ohio; Columbia Carbon Co., Charleston, W. Va.; Crown Chemical Co., Indianapolis, Ind.

## New Chemical Pump

The Arrow Pump Co., Buhl Building, Detroit, Mich., has incorporated its ring-oiled packing gland feature in a motor-driven centrifugal pump. While it is an economical and effective unit for a number of various purposes, it is distinctly so in chemical industry service, where it is important that a pump be immune from injurious effects of the liquid being handled.

The construction protects the bearings from coming in contact with the liquid being pumped and provides a positive supply of oil to them with its ring oiler. It is a centrifugal pump with only one working part, the impeller, which will wear indefinitely in most services. A priming chamber in the pump enables it to retain its prime and work within its suction capacity above the level of the supply without the use of mechanical prime retainers such as foot or check valves, which in service where liquid contains foreign matter are not dependable on account of such substance



ARROW CENTRIFUGAL PUMP

preventing valves from seating tightly.

The unit is compact. It requires no base and can be assembled for floor or side wall mounting. As both motor and pump bearings are ring oiled from large oil wells, they may be located in isolated places where little or no attention is given them over long periods.

## Pendulum Hardness Tester

Edward G. Herbert, Ltd., of Manchester, England, has put on the market an interesting machine for testing hardness. As seen in the illustration, the instrument is unique and simple. A yoke, containing adjustable weights, is balanced upon a ball of ruby or of steel 1 mm. in diameter. By means of the adjusting nut immediately above its support, the position of the inclosed weights, and therefore of the center of gravity of the entire instrument, may be varied somewhat. For ordinary tests, these adjustments are so made that the center of gravity is slightly below the ball, the entire mechanism being equivalent to a pendulum 0.1 mm. in length.

If this instrument is placed carefully upon a surface, is tilted to one side until an attached spirit level comes to zero and is then released, it will swing pendulum fashion, the oscillations gradually decreasing owing to the fact that some energy is absorbed by the supporting ball rolling out or elongating the original indention. Consequently the energy absorbed in thus displacing the metal is taken from the potential energy of the pendulum, and the swing is shortened. The position of the bubble on the scale at the end of the first swing shows the work done by the ball on the specimen and measures its hardness.

DETERMINING HARDNESS OF A MILLING CUTTER HELD IN A UNIVERSAL FIXTURE

Another useful method of conducting the test as recommended by the makers is to measure the time consumed in making ten swings. It is stated that tests taken either way are consistent among themselves and comparable each to each. An empirical relationship between hardness as determined by the pendulum hardness tester and the Brinell hardness scale has also been established.

SHRIVER DIAPHRAGM PUMP

## Diaphragm Pump for Filter Presses

A pump designed with parts moving in the liquid pumped is liable to excessive wear when pumping liquids containing gritty solids in suspension, such as are encountered in filter press work. With this fact in mind, T. Shriver & Co., of Harrison, N. J., have designed and are now marketing a diaphragm pump for use in conjunction with this filtering equipment.

In this pump the diaphragm is moved by a series of concentric rings on the one side and by a crescent shaped disk on the other. It is supported at all points during the discharge stroke and should have a very long life. The diaphragm and liquid end can be removed for cleaning or replacing in a few minutes by taking out a few bolts. The liquid passages are oversize so as to minimize friction, and the ball valves are of the self-cleaning type. The moving parts run in a bath of oil.

The makers claim that this pump is very efficient, generates pressure up to 100 lb. and has a very good suction lift. It is of the duplex type and is fitted with a large expansion chamber. The pressure generated is steady and shows very little fluctuation. The liquid end, being a simple casting, can be made of suitable materials such as cast iron, bronze, lead, hard rubber, etc., and the pump can be used for handling acids and corrosive liquids by choosing a suitable liquid end.

## Correction

*To the Editor of Chem. & Met., Equipment News Department:*

SIR—I note that you inserted, on May 28, an article on our C-22 brick under the heading of "High-Temperature Refractory." This is unfortunate, for our material is not recommended as a direct refractory except in certain cases, and we are anxious not to create an impression that might cause misuse of the material.

It is true, of course, that it will withstand conditions which in many cases would classify it as a refractory material. The material, however, is recommended and used as an insulating material and is very seldom exposed directly to the action of furnace gases, as is often the case with refractory materials.

We trust, therefore, that you will make this correction in an early issue of *Chemical & Metallurgical Engineering.*

CELITE PRODUCTS CO.,
A. W. KNIGHT,
General Sales Manager.

## Catalogs Received

CONVEYORS CORPORATION OF AMERICA, Chicago, Ill.—New booklet on steam jet conveyors.

AMERICAN FOUNDRY EQUIPMENT CO., New York City.—Bulletin 532. Bulletin on cloth screen type of dust arresters. Bulletin 535, on sandblast pressure tanks.

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis.—Bulletin 1822. A bulletin describing the Jones-Belmont flotation machine.

DWIGHT P. ROBINSON & CO., New York City—A folder showing some recent work of this firm of consulting engineers, including several chemical plants.

AJAX ELECTROTHERMIC CORPORATION, Trenton, N. J.—Bulletin 3. A new bulletin describing the Ajax-Northrup high-frequency induction furnace of 35-kva. capacity for use in obtaining temperatures up to 3,000 deg. C.

THE FOXBORO CO., Foxboro, Mass.—Bulletin 151. A new bulletin on the Foxboro type of triplex draft gage.

THE PFAUDLER CO., Rochester, N. Y.—A booklet entitled "A New Era in Milk Transportation," describing the new Pfaudler line of car tanks, truck tanks and container car tanks which are of interest to industry other than milk distribution.

# Review of Recent Patents

## Of Interest to the Ceramic Industries

### Developments in Manufacture of Glass, Refractories and Electrical Insulators

WITH the development of continuous tanks, automatic blowing machines and traveling leers, the production of bottles has become almost automatic. There is a break, however, between the blowing machines and the leers, this transfer being made almost entirely by hand, although a great deal of thought is directed toward the elimination of manual labor at this point. For example, Michael J. Owens has offered a solution in patent 1,455,966, issued May 22, 1923, and assigned to the Owens Bottle Co. As the bottles or other objects are hot and somewhat plastic as discharged from the forming molds, means must be provided for preventing them from knocking against one another or coming in contact until they have cooled to a certain extent. For this reason, the bottles slide down an inclined chute from the forming machine to a rotating disk, from which they are delivered by means of a stationary deflector to a belt conveyor which extends into and across the feed end of the leer. It is evident that the disk will serve to space the bottles on the carrying-in belt and thus prevent contact. If desired, the disk may be perforated and air blown through to assist in cooling the ware. From the carrying-in belt, the ware is discharged periodically onto the leer conveyor by means of a cam-operated pusher bar.

#### *Improving Structure of Bauxite Refractories*

In order to destroy the cleavage planes present in natural materials such as bauxite used in the manufacture of refractories and at the same time obtain properties which will permit molding without the use of a bond, Louis P. Kraus, Jr., of New York, first mixes the material with twice its volume of ground wood. An aqueous bonding agent is added and the mixture formed into blocks, which are dried and then heated to within 300 deg. F. of the melting point of the refractory material. The blocks are then crushed to the desired extent. The refractory material thus formed is composed of refractory grains of highly irregular shape with rough surfaces well adapted to knit together under pressure and with a high percentage of voids, the material being of a highly spongy nature. It can be compressed and molded dry with no bonding material, and is then able to withstand burning in the kiln to a higher temperature than usual, thus giving a more serviceable product. (1,453,468; May 1, 1923.)

#### *Slag Substitute for Magnesite Brick*

Magnesite converter linings are subject to rapid deterioration and their renewal is frequently a matter of serious concern, for there are times and localities when and where it is practically impossible to obtain magnesite brick. Attention is called by Calvin Payton of Douglas, Ariz., in patent 1,453,993, issued May 1, 1923, to a substitute, which is readily available wherever a converter is being run. This is nothing more than converter slag so prepared as to be high in magnetite and low in silica. Copper matte is blown in a converter without the addition of the usual excess silica and, as

## American Patents Issued June 5, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,458,167—Method of and Apparatus for Feeding Molten Glass. S. Davidson, Hillsboro, Ill., assignor to Schram Glass Mfg. Co., St. Louis, Mo.

1,458,204—Pump. R. W. Tibbetts, Roxbury, Mass.

1,458,234 — Separating Solids From Liquids. H. C. Miller, Bakersfield, Calif., assignor to Standard Oil Co. of California.

1,458,256—Cellulose Ether Composition. A. P. H. Trivelli, Rochester, N. Y., assignor to Eastman Kodak Co.

1,458,273-4 — Welding Apparatus and Process. M. S. Clawson, Upper Montclair, N. J.

1,458,283—Furnace for Melting Metals. G. D. Faulds, Philadelphia, Pa.

1,458,291—Apparatus for Dehydrating Petroleum Oils. F. W. Harris, Los Angeles, Calif., assignor to the Petroleum Rectifying Co.

1,458,309-10—Method and Process of Making Sulphite and Bisulphite Liquors. G. A. Richter, Berlin, N. H., assignor to the Brown Co., Berlin, N. H.

1,458,322—Process of Manufacturing Abrasive Disks. S. M. Bullock and H. S. Lloyd, Chicago, Ill.

1,458,338—Height Indicator for Liquids. R. Grimshaw and C. J. Weis, Clyde, Ohio.

1,458,351—Method and Apparatus for Producing Carbon. C. Matlock, Brooklyn, assignor to Munroe-Louisiana Carbon Co., Munroe, La.

1,458,357 — Apparatus for Extracting Volatile Matter. C. Postel, New York City, assignor to American Shale Reduction Co., New York City.

1,458,376—Method of Making Ceramic Products. Edward Anderson, Dayton, Ohio, assignor to the A. A. Simonds-Dayton Co., Dayton.

1,458,389 — Manufacture of Viscose Silk. E. Bronnert, Mulhouse, France.

1,458,403—Vacuum Dehydrator. C. E. Giessner, Portland, Ore.

1,458,410—Method of and Apparatus for Producing Charcoal and Byproducts. S. Hiller, San Francisco, Calif., assignor to Pacific By-Products Co., San José, Calif.

1,458,442—Method of Storing Salt. A. Schilling, San Francisco, Calif.

1,458,443—Process of Treating Hydrocarbons. A. Schwarz, Montclair, N. J., assignor to the Petroleum Sand Products Corp. of Delaware.

1,458,461—Process for Bleaching Barytes. L. K. Ayers, St. Louis, Mo.

1,458,467—Method of and Apparatus for Concentrating Ores. S. H. Dolbear, San Francisco, Calif., assignor of one-half to E. L. Oliver, San Francisco.

1,458,478 — Process of Producing a Catalyst From Vanadium Pentoxide and the Product Thereof. H. D. Gibbs, Penns Grove, N. J., dedicated to the government and people of the United States.

1,458,491—Method of Making Oxidized Aromatic Substances. R. H. McKee, New York City, and H. C. Cooper, White Plains, N. Y., assigned to said McKee.

1,458,491—Apparatus for Mixing. P. L. Mathews and R. M. Willis, Newark, N. J.

1,458,493—Varnish Composition. L. Mauerhofer, New York City.

1,458,525 — Process for Fixation of Atmospheric Nitrogen. F. Daniels, East Falls Church, Va., and O. R. Wulf, Norwich, Conn.

1,458,542—Process for the Manufacture of Dispersoids. H. Plauson, Hamburg, Germany.

1,458,543—Condensation Product and Method of Making Same. F. Pollack, Vienna, Austria.

1,458,568 — Method of Producing a Rustless Iron Alloy. W. Bennett, Wellington, New Zealand.

1,458,595—Process for Utilizing Impure Gases or Exhaust Gases Containing Carbon Dioxide. F. Riedel, Essen, Germany, assignor to Riedel Fertilizing Process Co., Elizabeth, N. J.

1,458,646 — Process for Absorbing Ethylene and Its Homologs. R. Engelhardt, W. Lommel, A. Assenbeck, Cologne, Germany, assignors to Farbenfabriken, Leverkusen, Germany.

1,458,650-1—Process for Production of Calcium Chloride. V. M. Goldschmidt, Christiania, Norway.

1,458,670 — Manufacture of Alkylized Derivatives of Hydrocupreine. H. Thron, Frankfort, assignor to Vereinigte Chininfabriken Zimmer & Co., Frankfort, Germany.

1,458,715—Process of Making Nitrobenzoic Acid and Intermediates. E. A. Lloyd, New York, and V. P. Gershon, Brooklyn, N. Y., assignors to W. M. Grosvenor, New York City.

1,458,723 — Refractory Compositions. J. L. Ohman, Buffalo, N. Y., deceased, by C. A. White, assigned to Buffalo Refractory Corp., Buffalo.

1,458,858—Process of Producing Homogeneous Porous Materials. M. O. Sem, Christiania, Norway, assignor to Norsk Industri Hypotekbank, Christiania, Norway.

1,458,893—Registering Mechanism of Gas Analysis Apparatus. O. Rodhe, Stockholm, Sweden.

1,458,899 — Refrigerating Apparatus. H. W. Wolfe, Philadelphia, Pa.

1,458,913—Non-Recrystallized Refractory Material. W. A. Farish, Buffalo, N. Y., assignor to the Buffalo Refractory Corp., Buffalo, N. Y.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

a result, a slag high in magnetic iron oxide and low in silica is produced, and this slag while molten may be poured into suitable molds and will upon cooling form bricks which may be employed for the purpose stated. In producing this magnetite slag, in the manner above pointed out, the temperature within the converter will rise as high as 2,600 to 2,700 deg. F., and it is at this temperature that the rapid oxidization of the iron content occurs and the magnetic oxide is formed. As the ordinary working temperature of a converter ranges from 2,200 to 2,350 deg. F., it will be understood that a lining of the magnetite slag will readily withstand this lower temperature. Of course the slag may be employed in various ways. It may, as stated, be molded in the form of bricks, it may be cast in lining sections of various shapes and dimensions, crucibles may be cast therefrom, and in fact the material may be employed as a lining or as a body material wherever the reduction of metals by fusion is to be accomplished.

### *Electrical Insulators From Powdered Talc*

Massive or solid talc, when free from seams or fissures, is in itself highly di-electric and is especially adapted for use in insulating articles, but is impractical from a manufacturing standpoint owing to the difficulty of obtaining large quantities in block form free from fractures and uniform in texture. It has also been found almost impossible to mold powdered talc and subsequently treat it without minute fractures being formed. It has recently been noted, however, that phenol condensation products may be used as temporary binders for powdered talc with excellent results. The mixture is molded into the desired shape under pressure, which for spark plug cores may be 25,000 lb. per sq.in. It is also desirable to apply a vacuum to the mold just before compressing, in order to eliminate entrained air. Heating to 200-400 deg. F. puts the molded material in condition for machining to final shape and dimensions, allowance of course being made for the slight, very uniform shrinkage which occurs in the subsequent operation of heating to about 2,000 deg. F. In some cases, the di-electric capacity at high temperature may be increased by impregnating the ware with soluble metallic compounds, sulphates and chlorides of aluminum, iron and chronium being preferable. After this treatment, the ware is again heated. (1,453,726; Theodore C. Prouty, of Los Angeles, assignor to Proutyline Products Co., May 1, 1923.)

### *A Filter Press for Wax*

The filtration of paraffine wax from chilled oil is in many ways an ideal filtering operation, particularly in the ease with which the filter cake can be removed from the press. High-pressure steam is normally used for the purpose of melting the wax away from the plate. Difficulties, however, are often encountered in completely removing the cake in this manner, and it is for the correction of these difficulties that George H. Fifield, of Culver, Ind., has been granted a patent, assigned to the Standard Oil Co. of Whiting, Ind. He provides a filtering apparatus, circular in form, having openings at least half the radius of the disks above their centers. On either side of the plate is mounted a disk of woven wire, provided with openings aligning with those in the plate.

In the process of removing the wax, steam is introduced through a small pipe in the inside of the larger filter openings. The heated pipe melts the wax surrounding it and enlarges the open passage for liquids through the press. Water, preferably at about 200 deg. F., is then introduced into this passage and rapidly melts the wax in the press. The relatively high position of the liquid passage through the press causes all the wax above the passage as well as below it to be melted. The melted wax drains through the filter cloth and out of the press, being separately collected for further treatment after separation of water from the melted wax by settling.

In many cases the introduction of steam for the purpose of melting the wax in the passageway may be entirely dispensed with, the hot water being directly introduced into the press and traveling through same channels as the oil and wax. (1,455,436, issued May 15, 1923.)

# Book Reviews

## Mechanical Preparation of Ores and Minerals

### Authoritative Treatment of an Important Phase of Chemical and Metallurgical Engineering

BY A. W. ALLEN
Assistant Editor, *Chem. & Met.*

TEXT BOOK OF ORE DRESSING. By *S. J. Truscott.* 680 pp., illus. New York: The Macmillan Co. Price, $11.

In these days of too-frequent irresponsible publication it is a pleasure to welcome the appearance of a technical treatise that breathes the atmosphere of the operating plant, yet withal is characterized by the ease of scholarly presentation. The treatise under review is such; and there can be no doubt that it will be given front rank among text books on the subject, which is one that is so intimately connected with chemical and metallurgical engineering that no excuse need be made for the appearance of a review in these pages.

The inadequacy of existing text books is given in the preface as the principal reason for the compilation of the volume; to the contention that such inadequacy exists few will disagree. Professor Truscott modestly attributes his competence for the task mainly to the published work and experiences of others. Lest this should be taken too literally, it will not be amiss to point out that he achieved an international reputation as a successful engineer and technical writer long before becoming professor of mining at the Royal School of Mines in London.

All text books on ore dressing begin with a definition of the term, which, to Professor Truscott, comprises "that series of preparatory operations to which crude ore is submitted till any further work to extract the metalliferous content is best conducted metallurgically." The impossibility of limiting the scope of metallurgical operations permits considerable latitude in the definition. The present volume deals with comminution, sizing, gravity concentration, flotation, magnetic and similar types of separation. Other text-book writers have included amalgamation as an essential phase of ore-dressing operations. Almost all consider flotation outside of consideration, possibly because it is a comparatively recent art. There may be disagreement that its practice should now be considered as non-metallurgical. A few years ago I endeavored to simplify matters by pointing out that "the various processes involved in the extraction and recovery of the valuable portions of an ore have specific designations," and that a clarification of ideas on the subject might result if ore dressing were considered as "covering the reduction or other mechanical handling of the ore, whereby one or more products are obtained in a condition to be treated for the isolation of their valuable contents by amalgamation, concentration, wet-chemical, smelting or other process of recovery." The disadvantage of Professor Truscott's classification is that flotation metallurgists and millmen may ignore the book, thinking that their specialty is not treated; others may be disappointed at the exclusion of what they have been accustomed to find in standard text books. However, these comments are by the way and of little moment. If fault can be found with

the book, it will be that the author has been generous in his interpretation of the scope of the subject, and readers will benefit accordingly.

Comminution is dealt with in a thorough manner. A discussion of the theory of crushing shows that the Kick-Rittinger controversy is by no means dead. Strong support for Kick's law is based on the fact that "if bodies of the same material and shape but of different mass be dropped separately from a height just sufficient to break them, it will be found that the height is much the same whatever the mass. Dropping from the same height the velocity factor in the energy developed remains constant, and that energy must vary as the mass; and since in each case the result is fracture, it may be assumed that the energy required to produce fracture varies as the mass or volume of the piece."

Chapters on sizing and what is termed water concentration are followed by a well-rounded account of the flotation process—methods, machines, agents, general aspects and theory. A feature of the book is the thorough manner in which magnetic, electrostatic, pneumatic and centrifugal separation has been treated. Final chapters discuss heat-treatment, the control of operations, ore-dressing systems and plants. Taken altogether, the volume gives evidence of careful and painstaking presentation, based on an intimate knowledge of the subject and an ability to present facts and theories with unusual clarity of expression. It will take its place in every technical library as an essential book of reference on the mechanical preparation and concentration of ores and minerals.

## *Elements of Agricultural Analysis*

QUANTITATIVE AGRICULTURAL ANALYSIS. By *Edward G. Mahin, Ph.D.* and *Ralph H. Carr, Ph.D.* 329 pp. McGraw-Hill Book Co., Inc., New York. Price, $2.75.

The authors state in the preface, "We recognize the futility of attempting to train students for technical or professional careers by teaching them only the technical notions and processes of chemistry without the scientific development of fundamentals." They have then proceeded, with this thought clearly in mind, to produce an excellent small volume dealing with the chemical analysis of agricultural products.

Part I contains chapters on the theory and general principles of analysis of most interest to the student of agricultural chemistry, with methods for the determination of some of the more common elements.

Part II covers special measures—namely, density and specific gravity, heat of combustion, index of refraction, optical rotation and hydrogen-ion concentration. In Part II the authors have performed a distinct service in emphasizing the importance to every chemist of a knowledge of the instruments and methods used in industrial work. It is to be regretted that the size of the volume limits, in several instances, a more detailed description of some of the instruments employed in every well-equipped laboratory.

In Part III consideration is given to the materials and products of chief interest to the agricultural chemist, such as feeds, oils, fats and waxes, dairy products, soils, fertilizers, insecticides and fungicides. The methods given for the necessary determination of the constituents of these products are, as stated by the authors, official where practicable.

The book is so well gotten up and such a valuable addition to our text books on chemistry, it is hoped that its reception may be such as to induce the authors to prepare a larger and more comprehensive text along similar lines.

W. W. SKINNER.

## *Metals and Alloys*

METALS AND THEIR ALLOYS. By *Charles Vickers.* Henry Carey Baird & Co., New York. 6x9 in., xix plus 767 pp., with 1°0 engravings. Price, $7.50.

Mr. Vickers has prepared a book that as a practical treatise on the non-ferrous metals and alloys is almost encyclopedic in its scope. Although conceived originally as a revision of Brannt's "Metallic Alloys," the necessary process of modernization has produced a work that is altogether unrecognizable as any kin of its acknowledged progenitor, and Brannt's name is preserved probably through sentiment on the part of its author. The book is comprehensive almost to a fault, including as it does nearly all that one would expect in the way of topics in a book on non-ferrous metals and several things—for example, a very casual chapter on iron, steel, cast iron, etc.—that could very logically have been omitted. Without the one chapter on iron the book would be 100 per cent non-ferrous. The one-book type of student turning to non-ferrous metallurgy would find this work a wonderful boon, because between its two covers is embraced something about almost everything.

One of several things that add value to this work is the fact that the author has drawn liberally from current technical journals and other more fragmentary sources for much of his material. This has given it an air of freshness and helped produce a volume that in matter is representative of modern conditions. Of course the specialist will find considerable that has been overlooked or that is slightly incorrect in reference to his own peculiar field, which will ever be the fate of general treatises.

One of the best chapters and by far the longest is the one on the history, production methods, properties and uses of the elements, especially those of metallurgical importance. Also the two chapters on the history, fundamentals, definitions and characteristics of alloy groups contain information of decided educational value to more than a few foundrymen and other metal workers. In the section on hardness and strength it is to be regretted that the important theories of Jeffries and of Rosenhain have not been included.

The chapter on alloying and melting is slightly too attenuated for so large a subject. Brasses and bronzes are treated quite fully in a half-score chapters on copper, aluminum bronze, copper-tin alloys, bell metal and other hard bronzes, phosphor and silicon bronzes, railroad alloys, steam metals and red brass, brass for rolling, brass for sand casting, manganese bronze and white brass. The industrially important light aluminum alloys receive a full chapter, but not nearly so much space as is given to the less important aluminum bronzes.

A noteworthy chapter, and one that our book literature has needed for some time, is that on nickel alloys, including Monel metal. Tin alloys and lead alloys each receive a chapter; and in the former the babbitt metal formulas of the Society of Automotive Engineers are missing; in fact the inclusion of the S.A.E. alloys in several other places in the book would have added considerable interest in this motorized age. Near the end of the book there is a chapter on the chemical analysis of babbitt metals—the only discussion of analysis in the whole book—that seems unnecessary in a work of this type.

The chapter on amalgams should be

## Important Articles In Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. Those that are of unusual interest will be published later in abstract in this department; but since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

THE COLLOID MILL. Anonymous. Current British practice in the use of Plauson's apparatus for producing colloidal solutions. *Engineering* (London), June 8, 1923, pp. 705, 706.

BULK MATERIALS HANDLING AND THE COMMON LABOR SHORTAGE. Matthew W. Potts. The various types of apparatus available and methods of operation described from the labor-saving standpoint. *Industrial Management*, June, 1923, pp. 338-345.

SEPARATING THE GASES FORMED IN THE *n*-BUTYL ALCOHOL-ACETONE FERMENTATION PROCESS. E. W. Blair, T. S. Wheeler and J. Reilly. Investigation of a fractional solution method for separation and collection of carbon dioxide and hydrogen. *J. Soc. Chem. Ind.*, June 1, 1923, pp. 235T-240T.

RECENT DEVELOPMENTS IN CHEMICAL PLANT. Arthur B. Scover. (*a*) Details of an acid-resisting centrifugal pump with equivalent height of lift 100 ft., delivery 4,500 gal. per hr., sp. gr. 1.7. (*b*) A new type of gas scrubber. *J. Soc. Chem. Ind.*, June 1, 1923, pp. 240T-242T.

THE SORPTION ACTIVITY OF CARBON. J. B. Firth. Method of activation, factors affecting activity and theory of mechanism. *J. Soc. Chem. Ind.*, June 1, 1923, pp. 242T-244T.

PROFIT AND LOSS METERS FOR STEAM PLANTS. S. H. Childs. Application of a standard cost system to the paper mill. *Paper Trade Journal*, June 14, pp. 57-59.

very welcome, since it contains considerable matter of not very common knowledge. Another chapter valuable for the same reason is the lengthy one on the alloys of the precious metals. Fusible alloys, along with cadmium and bismuth, receive such recognition as is due.

Other subjects treated in separate chapters are magnesium alloys, zinc alloys, die castings and their alloys, soft solders and brazing alloys, and miscellaneous alloys. The chapter on the surface coloring of alloys is well worth while. The closing chapter is a general miscellany of the usual nondescript data that is more or less typical of foundry handbooks. This chapter ends with a rather anemic glossary which needs careful revision. For example, "binder" in many foundries means something quite other than a mechanical clamp for molds; nor is "air-hole" a correct definition for "blow-hole"; also if "facing" is defined, why is "parting" omitted? and lastly we do not believe that many authorities will agree that an alloy may be defined always as a solid solution of two or more metals.

The book has the great advantage of having been written by an experienced technical writer whose English is clear and facile. For this reason as well as for its wealth of material and for its freshness this book is to be recommended.

G. K. ELLIOTT.

## New Publications

DIE ENTWICKLUNG DER CHEMISCHEN TECHNIK, BIS ZU DEN ANFÄNGEN DER GROSSINDUSTRIE. By Gustav Fester. Published by Verlag von Julius Springer, Berlin, Germany. Price $1.80. A comprehensive history of chemical technology from the time of the early Egyptians to the beginning of the nineteenth century.

COLUMBIA UNIVERSITY has published Engineering and Scientific Paper 12, April, 1923, on "Comparative Tests of Clay, Sand-Lime and Concrete Brick Masonry," by Albin H. Beyer and William J. Krefield, of the department of civil engineering.

THE UNIVERSITY OF MINNESOTA has issued Bulletin 3, from the Engineering Experiment Station, on "The Manufacture of Portland Cement From Marl," by Raymond E. Kirk.

THE BUREAU OF STANDARDS has revised the Mollier chart of the properties of ammonia, which is available as Bureau of Standards Miscellaneous Pub. 52.

## Calendar

AMERICAN CHEMICAL SOCIETY, fall meeting, Milwaukee, Wis., Sept. 10 to 14.

AMERICAN ELECTROCHEMICAL SOCIETY, forty-fourth meeting, Dayton, Ohio, Sept. 27 to 29 (dates provisional).

AMERICAN ELECTROPLATERS SOCIETY, eleventh annual meeting, Providence, R. I., July 2 to 5.

AMERICAN GAS ASSOCIATION, annual convention, Atlantic City, Oct. 15 to 20.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, INC., Ontario and Quebec, Aug. 20 to 31.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS, iron and steel exposition, Buffalo, N. Y., Sept. 24 to 28.

AMERICAN SOCIETY FOR TESTING MATERIALS, twenty-sixth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 25 to 30.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES (NINTH), New York, Sept. 17-22.

NATIONAL SAFETY COUNCIL, twelfth annual safety convention, Statler Hotel, Buffalo, Oct. 1 to 5.

# Men in the Profession

KENNETH E. BELL has resigned his position with the Lewis Recovery Corporation to accept one as chemical engineer for the A. C. Lawrence Leather Co., Peabody, Mass.

C. F. CARRIER, JR., general manager of the Carrier Chemical Co., Charleston, W. Va., will address the annual convention of the West Virginia State Pharmaceutical Association. His topic will be "Contact Points."

EDWARD B. DURHAM has accepted the position of engineer for the Mammoth Plant of the U. S. Smelting, Refining & Mining Co., at Kennet, Shasta Co., Calif., and will take up the work there before July 1. He was formerly maintenance engineer for the Standard Chemical Co. at Canonsburg, Pa., and since March 1, 1923, has been with the Koppers Co. of Pittsburgh, Pa.

F. M. FEIKER, formerly vice-president of the McGraw-Hill Co., Inc., and more recently on leave of absence as special agent to the Department of Commerce at Washington, will, after his return from Washington, be associated with the staff of the Society for Electrical Development, New York City. Mr. Feiker will retain a consulting relation to the McGraw-Hill Co., Inc., and he will continue in a similar capacity his relation to the problems of personnel and organization of the Department of Commerce.

P. J. FREEMAN, for the past 7 years engineer of tests at the Pittsburgh Testing Laboratory, has opened offices for private practice as a consulting engineer at 311 Ross St., Pittsburgh, Pa.

Dr. E. C. GANGLOFF, formerly research chemist with the National Aniline & Chemical Co., is now chief chemist with Dextro Products, Inc., Buffalo, N. Y.

J. H. HILDEBRAND, professor of chemistry at the University of California, has been appointed dean of men—an office recently instituted by the president-elect, Dr. W. W. Campbell. The appointment is a popular one, especially among the young men of the campus, by whom Dr. Hildebrand is held in high esteem.

JOHN F. KELLER of Purdue University gave an interesting address on the subject of steel and treatment of steel before a meeting of Columbus, Ind., manufacturers, at the Columbus Chamber of Commerce rooms, June 12.

A. R. KEMP, a graduate of the California Institute of Technology, arrived at Pasadena, Calif., recently, to undertake chemical and engineering work in connection with the laying of two telephone cables between San Pedro and Catalina Island. Mr. Kemp left the Institute in 1918 to accept a position as research chemist with the Western Electric Co. in New York. He has given particular study to the development of an insulating material for submarine cables.

Prof. G. N. LEWIS, dean of the college of chemistry of the University of California, has been granted leave of absence from July 1 to Dec. 31, 1923, to serve as a representative of the United States at the International Union of Pure and Applied Chemistry in England.

WILLIAM H. PIERCE has been elected vice-president of the American Smelting & Refining Co., New York, in charge of refinery operations at Baltimore, Md., Perth Amboy, N. J., and Omaha, Neb.

FRANK N. SPELLER, metallurgical engineer of the National Tube Co., Pittsburgh, Pa., received the honorary degree of Doctor of Science from the University of Toronto at its convocation, June 7.

GERALD SWOPE, president of the General Electric Co., Schenectady, N. Y., received the honorary degree of Doctor of Science at Rutgers College and State University of New Jersey, New Brunswick, at commencement, June 12.

CHARLES P. VAUGHAN of Philadelphia, Pa., president of Dungan, Hood & Co., Inc., manufacturer of glazed kid, and also president of the Philadelphia Chamber of Commerce, has sailed for Europe, where he will make a study of conditions in the leather industry in twelve different countries. He will be absent for 3 months.

Dr. W. R. WHITNEY, director of the research laboratory of the General Electric Co., was recently elected a member of the corporation of the Massachusetts Institute of Technology for a term of 5 years. He was graduated from M.I.T. in 1890 and has for some time been a non-resident professor of theoretical chemistry at the institution. WALTER HUMPHRAYS, '97, of Brookline, and CHARLES R. MAINE, '09, a prominent consulting engineer of Boston, were also elected to the corporation, these three succeeding PAUL W. LICHFIELD, ARTHUR D. LITTLE and EBEN S. STEVENS.

## Obituary

PAUL SCHNORIENBERTER, general manager of the Heiler & Merz Co., New York and Newark, N. J., died suddenly of heart disease, June 11, while seated at his desk. He was 44 years of age.

CHARLES F. WELLS, of Pittsburgh, Pa., vice-president and treasurer of the National Lead & Oil Co., died June 11, at Cedarville, Mich., where he had gone about 2 weeks previously. He was 62 years of age.

# Industry and Trade

*Current News and Market Developments*

## Summary of the Week

Oil litigation involving $300,000,000 under way in San Francisco court.

Chemical Foundation suit, adjourned for week, makes little progress.

Society for the promotion of engineering education holds important meeting at Cornell.

German financiers announce founding of factories in this country.

United States Bureau of Standards will be asked to evolve standard test for imported coal-tar products.

Rhineland High Commission places June 30 as latest date for filing applications for import and export trade with the Ruhr.

Casein probably will be first of chemical items to be granted hearing by Tariff Commission.

Leading sellers of soda ash and caustic soda announce that prices will be quoted hereafter on flat basis.

Bureau of Census report on cottonseed products shows stocks of cottonseed oil smaller than a year ago.

Lack of funds may restrict personnel of customs service throughout coming year.

Demand for calcium arsenate has not become active and prices are irregular.

Trading in cottonseed meal futures will be opened up at Memphis on July 1.

Department of Commerce will issue import and export statistics simultaneously, having caught up on import figures.

Imported copper sulphate has recovered from recent price weakness.

Arsenic is unchanged on spot, but futures were lower in price.

Foreign makers of prussiates appear eager to hold American trade and prices are weak under this selling competition.

Poduction of coke from byproduct ovens amounted to 3,328,000 net tons in May, which was an increase of 3.8 per cent over April.

High protective tariff on sulphur proposed in Spain, in order to stimulate activity in the industry.

U. S. General Appraisers give decision, holding that tankage is subject to import duty of 10 per cent ad valorem, as waste.

## Consumption of Cottonseed Oil in May Estimated at 128,871 Bbl.

### Bureau of Census Report Shows Light Stocks—Visible Smaller Than Last Season—Demand Less Active

THE DISTRIBUTION of refined cottonseed oil into consuming channels during the month of May, according to an analysis of the Bureau of Census report on cottonseed products for the 10 months ended with May 31, amounted to 128,871 bbl. This compares with 151,233 bbl. in April and 179,770 bbl. in May a year ago. In view of the low position of lard and the inability to export, because of the high prices, the consumption for the month of May was considered good. The report revealed nothing new to traders and the tight statistical situation was offset, as a market factor, by the less favorable condition of the vegetable oil trade.

The visible supply of refined oil on the last day of May, converting the stocks of crude oil and seed at the plants into refined, was placed at 627,000 bbl., which compares with 707,000 bbl. on the corresponding day a year ago. Seed not yet accounted for will produce approximately 38,000 bbl. of refined oil, against an actual production of 25,000 bbl. for the last 2 months of the 1922 season.

The crop year officially ends with the last day of July, but new oil will not come on the market in a large way before late September. Refiners must hold enough old crop oil in reserve to meet the regular trade requirements and, from present indications, the carry-over, on July 31, will be even smaller than last year, when the total was estimated at 434,325 bbl.

Consumption of refined cottonseed oil for the 10 months ended with May 31, reached the total of 2,040,000 bbl., which compares with 1,975,000 bbl. for this period a year ago.

Average monthly consumption of refined oil for the 10 months ended with May 31 amounted to 203,750 bbl., as against 19 500 bbl. a month for the first 10 months of the previous season. Actual monthly consumption for June and July a year ago was 144,300 bbl. Reports on the condition of trade for the first half of June this year were not encouraging, and operators do not expect so good a showing for the entire month as for June a year ago. The action of competing oils, such as soya, corn and sesame, may have some bearing upon the market. Old crop crude cottonseed oil, during the past week, held at 9c. bid and 9¼c. asked, f.o.b. mills, tank car basis. New crop crude (Nov.-Dec.-Jan.) was nominal at 7c. per lb., f.o.b. mills.

Receipts of cottonseed at the mills from Aug. 1, 1922, to May 31, 1923, according to the official report, amounted to 3,208,085 tons, against 2,889,002 tons for the corresponding period a year ago. The amount of seed actually crushed for the 10 months ended with May 31 was 3,193.524 tons, which compares with 2,962,849 tons a year ago.

Production of crude cottonseed oil for the 10 months ended with May 31 amounted to 982,756,658 lb., as against 916,025,098 lb. a year ago. The production of refined oil for the 10 months period amounted to 873,994,702 lb., as against 815,116,501 lb. a year ago.

The output of cottonseed meal for the August-May period was reported at 1,462,327 tons, as against 1,335,373 tons a year ago.

The stocks of seed at the plants on the last day of May amounted to 23,098 tons, which compares with 23.380 tons on the corresponding date a year ago. The stocks of crude oil on May 31 were estimated at 24,195,802 lb., which compares with 23,703,854 lb. a year ago. The stocks of refined oil on hand on May 31 amounted to 222,863,042 lb., as against 254,518,251 lb. on the last day of May a year ago.

# Text for Rhineland Order Authorizing Sale of American Owned Goods

## Proceeds of Sale Less Expenses Will Form "Consignment Account"—Owner Will Be Reimbursed in Francs

THE TEXT of the order of the Rhineland High Commission, which authorized the sale of goods owned by Americans and also the sale of other merchandise held by the railway lines, was received a few days ago by domestic importers. Translation of the order is as follows:

The Interallied Rhineland High Commission regarding Order No. 149—Considering the fact that, as a result of orders given by the German Government, considerable merchandise remains standing on the railway lines of the occupied territories, and that this fact is such as to affect the interests of the population and to block public service which has been taken over by the Administration of the Railway Lines, it has been necessary, therefore, to take measures in order to remedy this situation.

*Article* 1—On and after June 10, 1923, cars which remain standing on the railway systems operated by the Administration of Railroads may be unloaded; and the merchandise, whether on the cars or in the warehouses, may be sold under the hereinbelow stated conditions:

*Article* 2—The Administration of the Railroads in the occupied territories will turn over on June 10 all loaded cars and all merchandise stored in warehouses to the Franco-Belgian Restitution Services, which will have charge of their liquidation.

An official report will be made out for each transfer made by operation of the present article.

*Article* 3—All claims relative to stalled freight cars or merchandise will have to be forwarded before June 10 to the Franco-Belgian Restitution Services. These will see that they are delivered to the consignees or to the shipper of the merchandise when claimed, and will sell all merchandise whose owners cannot be identified, or which has been refused, or which cannot be forwarded to its destination owing to the refusal of the German Railroad Administration to provide for uninterrupted transportation.

*Article* 4—Before each sale an official report will be made out, giving as far as possible all particulars which might help to identify the merchandise and subsequently enabling the owners to establish their rights to be paid the proceeds.

This official report will be completed after the sale by stating the price received and expenses reimbursed to the Administration of the Railways and to the Restitution Services.

*Article* 5—The proceeds of the sale of the merchandise, after deducting the expenses incurred by the Administration of Railways and the Restitution Services, will be entered by the Restitution Services in a special account, to be known as the "consignment account."

During the period of one year the owners of merchandise sold, or their assigns, may obtain, after establishing their claims, reimbursement in French francs of the sums entered in this account.

They will be entitled to no other indemnity, either from the Railway Administration or from the Restitution Services, but all their rights will be reserved as against the German departments whose default shall have caused them injury.

At the expiration of the period of one year, as provided above, the proceeds of the sale will be turned into the treasury of the administration.

*Article* 6—By derogation of Article 5 above, the Administration of the Railways is authorized immediately upon the expiration of the period fixed in Article 1 to use itself the fuel and generally all other material fit for use in operating the railroads which have been left standing on the tracks.

The value in French francs of this merchandise will be determined by experts appointed by the French-Belgian Restitution Services.

The Restitution Services will make out an official report covering the delivery of such fuel and material.

*Article* 7—The value of merchandise so utilized by the Administration will be entered in a special account to be kept by the Restitution Services.

Within one year the owners of this merchandise, or those having a right to the same, may, after establishing their rights, claim reimbursement of this value from the Restitution Services.

The Restitution Services, after verifying the rights and the identity of the claimants, will furnish them with a certificate, on the presentation of which the Railway Administration will pay them the amount in French francs of the value indicated in the special account, upon their waiving all future claims against it.

*Article* 8—The Railway Administration in the occupied territories cannot be considered, in any case, as responsible for damages, losses, diminution in weight or value of merchandise the liquidation of which is directed by this order.

*Article* 9—Judicial actions relative to differences which might arise from the enforcement of this order will be referred to arbitration commissions, the membership and functioning of which will be governed by an order of the High Commission.

## Steel Men to Meet With Ordnance Officers

The board of directors of the American Iron and Steel Institute has accepted the invitation of the Army Ordnance Association to meet with it next fall at the Army Ordnance Proving Grounds, Aberdeen, Md. For this reason the next general meeting of the Institute is to be held at Hotel Commodore, New York City, a day in advance of the date previously set—that is, Thursday, Oct. 25, instead of Friday, Oct. 26. Special train accommodations are to be provided to make the journey on Thursday night so that Friday may be spent at the proving grounds.

## Iodine Combine Active

The Iodine Combine, which under its former organization was to have terminated on March 31 last, has extended its time of existence as such to June 30. The object of this association of Chilean producers is to centralize sales and to market their product under terms of mutual agreement. It is now desired to introduce modifications in the statutes of the society, and the extension of the existing system has been made to afford time for study.

The proposed reforms in the statutes have now been drawn up and will be submitted to those interested in the industry. Under these new regulations, the old Iodine Combine will become the Association of Iodine Producers of Chile.

As outlined at the present time the program of the association will include encouragement of the consumption of iodine throughout the world, the consolidation of the industry by uniting all the iodine producers and stockholders of the country, the marketing of the product, the framing of agreements with producers in other countries as to the sale and supply of iodine and finally the defence and progress of the industry.

## Thomas Meal Advances in Price in Switzerland

The price of "Thomas meal," a basic slag fertilizer extensively used in Switzerland, has advanced recently because many blast furnaces of the Ruhr district of Germany have been idle on account of the occupation, according to a report from American Vice-Consul William H. Mathee at Zurich.

Authentic reports are quoted by the vice-consul indicating that the production of "Thomas meal" is being reduced daily and that the lack of new stocks will be felt seriously as soon as the demand in Switzerland reaches the peak this summer.

The situation is described as similar to that of the spring of 1922, when, on account of dininished production, the price of this fertilizer rose within a short time from 40 to 48 centimes per kilogram. Today "Thomas meal" is still obtainable f.o.b. Basel for 42-43 centimes per kilogram.

## News Notes

**Natural clays** possessing desirable properties for use in paints, stains, water colors and toilet articles have been discovered by G. C. Carver in the vicinity of Tuskegee, Ala. He claims to have used this clay with marked success in the manufacture of all these articles.

**Zinc has recently been supplied** to Japan by the Electrolytic Zinc Co. of Tasmania in successful competition with American producers. Japan uses approximately 40,000 tons of the metal annually. Several shipments are reported to have been made from Tasmania.

**Three fellowships** in the engineering experiment station of Ohio State University at Columbus are being offered jointly by the Department of the Interior and that institution. College graduates who have had sufficient training in metallurgy, pottery or chemistry to carry on ceramic work are eligible. The object in creating these fellowships is to solve definite problems confronting the pottery industry.

**A new Spanish glass factory** is reported. The company behind the new enterprise has been formed under the auspices of the Compagnie Internationale pour la Fabrication de la Verre, with a capitalization of 3,000,000 pesetas. According to the Reuter dispatch, the Libbey-Owens system is to be employed in manufacture.

**An oxy-acetylene welding course** has recently been outlined by the American Welding Society. The Federal Board of Vocational Education and the National Research Council have co-operated in the work of preparing this course, which covers the subject from the viewpoint of the person choosing and training candidates. Copies of the course may be obtained by writing the society at 29 West 39th St., New York City.

**The iron ore resources** of British Columbia are to be surveyed by Dr. G. A. Young of the Canadian Geological Survey. This work was begun last year by Dr. Young, who has made similar surveys in Eastern Canada.

**The American Cotton Oil Co.**, New York, is arranging for curtailment at its different plants. The fourteen mills of the company in the South devoted to crushing will be closed gradually, and will be kept inactive until conditions in the industry improve. The oil and fertilizer plants at Gretna, La., will also be discontinued temporarily. A number of the refining plants of the company will remain on the active list.

**Twenty-seven cement-producing mills** represent the cement interests in Canada, according to a list just published by the Mines department. These vary in capacity from 200 bbl. per day to 12,000, the greater proportion having a capacity of from 1,000 to 4,000 bbl. daily. The Canada Cement Co., at its Montreal mill, has the maximum capacity of 12,000 bbl.

**Copper and brass consumption** in England is to be promoted by a new organization formed along much the same lines as the Copper and Brass Research Association in this country. In that country the organization is to be known as the Extended Uses Council. The use of solid brass hardware in place of brassed steel goods is to be particularly promoted.

**Another serious oil fire** occurred in Pittsburgh on June 15, when a tank at the Atlantic Refining Co.'s plant was struck by lightning. Eighty persons were injured, more than 100,000 bbl. of oil was burned and a damage of upwards of $1,000,000 was done before the flames were controlled after 26 hours of fighting.

**The United States Glass Co.**, Pittsburgh, has taken over the mold-making establishment operated for nearly half a century by the late W. S. McKee. According to present arrangements a complete line of tableware molds and general ware molds will be produced.

**The Canadian Salt Company, Ltd.**, has had to double the capacity of its liquid chlorine plant, which it put into operation last October. The company is also erecting a new caustic finishing building with the latest improvements which will considerably increase the capacity of that department.

## Big Oil Suit Starts

Litigation between the Standard Oil Co. of Indiana and the Universal Oil Products Co. is now under way in San Francisco courts. The litigation is said to involve $300,000,000. The patent rights in question are those covering the Dubbs process, which is employed by the Universal company, and the Burton process, used by the Standard Oil Co. of Indiana.

The Universal Oil Products Co. contends, through its attorney, United States Senator James Reed of Missouri, that its patents control the basic procedure for the manufacture of high test gasoline by cracking crude oil. The Standard Oil, disputing the Universal claims of infringement, is represented by Russell Wiles of Chicago.

Approximately half of the world's production of gasoline is said to be manufactured by cracking higher boiling distillates. For that reason the sum involved is enormous. The case is being heard by Federal Judge Holmes Hall, of Sedalia, Mo.

## Italy Building Celluloid Industry

Italy is trying to build up a domestic celluloid industry. The decree now before the Parliament carries a duty of 24 cents on the raw material, but an effort is being made to secure a higher rate. A large plant is under construction in the Province of Como.

## Mining Engineers Planning Elaborate Fall Meeting

Final announcement of the August meeting of the American Institute of Mining and Metallurgical Engineers has been issued. It is planned to gather at the Entrance Hall of the Parliament Buildings in Toronto Monday morning, Aug. 20. Late that night the party will start on a tour in a special train, visiting the nickel operations at Sudbury on Tuesday, the silver mines and mills in the Cobalt region on Wednesday and Thursday. Friday will find the members in the Kirkland gold district, Saturday and Sunday in the Porcupine district, where is located the Hollinger, probably the most important gold mine in the world that is now operating.

Tuesday, Aug. 28, the party will spend sightseeing in Quebec, Wednesday will be spent at the asbestos mines and dressing plant at Thetford. On Thursday and Friday the technical sessions and banquet will be held in Montreal. Cost of the entire excursion, starting at Toronto and ending at Montreal, is estimated at $200, and includes transportation, pullman accommodations, meals, hotel rooms and automobile excursions. Reservations must be made prior to July 20.

## Fall A.E.S. Meeting Planned

Dayton, Ohio, will be the scene of activities for the fall meeting of the American Electrochemical Society, which is to be held Sept. 27 to 29. An innovation at this meeting will be a round-table discussion of electric furnace brass foundry practice, organic electrochemistry, chlorine and electroplating.

The plans for the meeting also include two symposiums, one on electrochemistry of gaseous conduction, which is in charge of Dr. Duncan MacRae, Research Laboratory, Westinghouse Lamp Co., Bloomfield, N. J. and another on recent progress in electrolytic refining; chairman, F. R. Pyne, U. S. Metals Refining Co., Carteret, N. J.

Trips and social events will be announced later.

## Larger Candelilla Wax Shipments From Nuevo Laredo

Exports of candelilla wax from Nuevo Laredo, Mexico, from Jan. 1 to April 7 were 82,233 lb., which is more than the grand total for the 4 years preceding.

The practically sudden demand for the candelilla is attributable to four or five factors, but the chief explanation is unquestionably found in a low price, combined with the fact that the candelilla and its uses are becoming more widely known. The present movement is probably for the account of European factories, since all of the shipments through here have been consigned to commission houses of New York City. The current prices in Nuevo Laredo average 18.5c. per pound, which is the record low quotation for the local market.

# Washington News

## Slow Release of Imports May Continue Over Next Year

With imports pouring into the country in quantities far surpassing any previous period, officials of the Treasury Department are confronting a problem of rendering service to the business interests involved, with a personnel smaller than the force of the Customs Division before the world war and which has just been given the additional duty of enforcing the regulations prohibiting vessels entering American waters from carrying intoxicating liquors.

Drastic reduction of the customs force in the last half of June because of an approaching illegal deficit was avoided only by the intercession of President Harding, who authorized a $60,000 deficit. The appropriation available for the fiscal year 1924, beginning July 1, for collection of customs revenues with all the duties placed upon that division of the Treasury Department, is less than $12,000,000.

Treasury officials frankly confess that unless there is a very decided decrease in imports, the appropriation available for the new year will not provide sufficient personnel to handle imports expeditiously and at the same time protect the revenue of the government. It has been difficult to hold a force of laborers at the government piers because of a limitation of $1,080 a year on the wages paid such workers. This condition has been relieved by a special law removing the limit but without providing additional funds for payment.

Congestion at New York has been relieved to a large extent, customs officials report, by dock inspections of imports, thus avoiding transfer to the appraiser's stores, and by inspecting one case as a sample of a shipment of a number of cases. They do not feel, however, that this system sufficiently protects the revenues.

With prohibition work put upon the Customs Division, thus diverting the activities of part of the force, conditions after July 1 threaten to be more serious in delaying imports than they have been unless some remedy not yet discovered is worked out.

## Heavy Lac Exports From India

During the first 3 months of 1923 the exports of lac from India to the United States totaled approximately 96,000 chests of 164 lb. each. Exports to the end of April are expected to bring this figure up to 125,000 chests, which, for the 4 months, will represent about one-half the normal annual shipments to the United States. The principal lac crop comes in May and June, with heavy exports to America usually taking place in the fall, so that the figures for shipments during the early months of this year appear quite large.

## Standards Bureau Giving Dyes Much Attention

Problems of dye standardization are receiving intensive attention at the Bureau of Standards of the Department of Commerce. One chemist is devoting exclusive attention to this subject and it is hoped to add to the facilities after the new fiscal year starts July 1.

Standardization is being approached through methods of identification of species, determination of color strength and determination of quality. Other problems, such as a method of assuring matching of colors in textiles, are to be taken up.

A report on dye standardization work at the bureau was submitted June 1 by Dr. C. E. Waters, chief of the Chemical Division, and W. D. Appel, dye specialist, to the main advisory committee of the Textile Division, composed of representatives of the larger textile trade associations. The advisory committee voted to request each textile trade association to appoint a committee of from one to three members to cooperate with the Bureau of Standards in its dye work.

## I.C.C. Recommends Lower Rates on Acid and Feldspar

The Seaboard By-Product Coke Co. should be awarded reparation on various shipments of sulphuric acid from Grasselli and Brills to Seaboard, N. J., in the opinion of Burton Fuller, an Interstate Commerce Commission examiner. He finds that unreasonable rates were assessed on 39 carloads of sulphuric acid.

As a result of a complaint brought by the Ceramic Traffic Association, Paul O. Carter, an Interstate Commerce Commission examiner, has reported that the rates on feldspar from producing points in Maine, New Hampshire and Connecticut to New Jersey and Pennsylvania destinations are unreasonable. He suggests a series of lower rates on crude and ground feldspar which he asks the commission to prescribe for the future.

## Prohibitive Tariff on Sulphur Proposed for Spain

The United States continues to supply a large proportion of the sulphur used in Spain, but an effort now is being made by the producers of sulphur in that country to secure a prohibitive tariff in the hope that their properties may be restored to their war-time activity. The proposal of the producers to place a high tariff on imported sulphur is actively opposed by the agricultural interests. The use of sulphur in connection with fertilizers and in the protection of grape vines makes it an important item in their costs.

## Chilean Nitrate Sales Larger Than in Preceding Year

A survey of the Chilean nitrate trade as made by George A. Mackinson, consul at Valparaiso, states that the industry has almost completely recovered from the disastrous speculative slump of 1921. Sales effected during the first three-quarters of the present nitrate year, which began on July 1, total 21,851,078 metric quintals. This is only 15 per cent less than the quantity sold in the same nine-month period during prosperous war years and represents nearly triple the quantity disposed of during the first three-quarters of the past nitrate year.

March sales announced by the Producers' Association amounted to 1,966,331 metric quintals, as compared with 1,685,403 quintals in February and 1,960,742 in January. Sales effected by the association up to the end of March totaled 19,655,346 metric quintals, while "outside" sales, including 1,010,084 quintals credited to the two American companies, amounted to 2,133,762 metric quintals. The delivery dates of the association sales are as follows:

| Month of Delivery 1922 | For Export Metric Quintals | For Consumption Metric Quintals | Total Metric Quintals |
|---|---|---|---|
| July | 2,407,565 | 1,016 | 2,408,581 |
| August | 1,639,599 | 7,586 | 1,647,185 |
| September | 1,809,657 | 9,428 | 1,819,080 |
| October | 1,991,361 | 17,289 | 2,008,655 |
| November | 1,618,407 | 5,042 | 1,623,449 |
| December | 109,798 | 1,609 | 111,407 |
| 1923 | | | |
| January | 1,977,716 | 508 | 1,978,224 |
| February | 2,701,970 | 3,058 | 2,705,028 |
| March | 2,051,595 | 2,032 | 2,053,627 |
| April | 611,124 | 508 | 611,632 |
| May | 1,016 | ..... | 1,016 |
| June | 2,687,456 | ..... | 2,687,456 |
| Total | 19,607,264 | 48,076 | 19,655,340 |

The March production of the fifty-nine plants now working amounted to 1,452,644 metric quintals—an increase of 733,031 quintals over the output of the thirty-one plants operating during the corresponding month of 1922.

Exports from the various ports of Chile during the past month totaled 2,226,017 metric quintals, as compared with 2,705,979 quintals in February and 2,225,139 quintals in January. Total exports for the first 3 months of the previous year amounted to only 1,036,480 metric quintals. Approximately 50 per cent of the 1923 exports has gone to the United States.

Stocks on the coast are being steadily reduced and at the close of the month amounted to less than 10,000,000 metric quintals, as compared with 15,713,140 at the end of the third quarter of the last nitrate year.

## Tankage Held Dutiable

The claim of Gallagher & Ascher, of Chicago, for the free entrance of tankage has been overruled by the U. S. General Appraisers. Their decision is that it is dutiable at 10 per cent ad valorem as waste, not specifically provided for, under paragraph 384 of the tariff act.

## Chemical Foundation Has Peaceful Week

The past week has been very quiet in the courtroom at Wilmington, Del., as far as the government's suit against the Chemical Foundation has been concerned. An adjournment was declared on June 15 for a week. Thus both sides gained an opportunity to catch second wind. The defence, with William D. Guthrie and Isador J. Kresel as leading attorneys, is expected to open its side of the case within a few days. Up to the present writing they have held the floor of the court only long enough to carry out their examination of the witnesses presented by the government. It is thought in some quarters that the entire case of the defence will be presented before dismissal is asked for. That the asking of such dismissal is regarded as likely by the court is evident from Judge Morris' question addressed to Kresel as to whether he might not take this step.

As the case stands, practically none of the evidence introduced by Colonel Anderson, attorney for the government, is held to be directly applicable. Although it is not understood at the time of going to press that Judge Morris has announced a definite decision to that effect, it is known that he has frequently questioned the right of the court to pass on acts of executive discretion carried out by the President.

The question of recompense is in dispute. The government's contention that $250,000 was entirely inadequate payment for the 4,800 patents is met by the argument of the defence that while the sum paid was not extremely high, still the Foundation has made use of these patents for the greatest good of the people and the industry at large.

## Chemists Achieve New Victory Over Disease

The economic development of Africa has been greatly hindered by the prevalence there of sleeping sickness. A new compound developed by the Rockfeller Institute has recently been used successfully in combating this disease. Experiments covering a period of nearly 10 years have been required to develop the compound, which is the sodium salt of N-phenylglycineamide-para-arsenic acid. The *Journal* of the American Medical Association in a recent number outlines the history of the new drug.

## Sicily Increases Exports of Sulphur Oil

The United States is taking more and more of Sicily's sulphur oil. During the first 3 months in 1923 exports to the United States from that island aggregated 1,280,011 lb. The Sicilians are in a position to offer particularly low prices on sulphur oil from the fact that it is obtained from treating the carbonate of sulphur after it has been used in extracting the residue of oil from olive pulp.

## Canada Likes Idea of City Coke Plants

### To Make an Extensive Survey of the Possibilities of Domestic Heating With Byproduct Coke

The possibilities of coking bituminous coal for domestic heating in Canada and some idea of the plans that are likely to materialize in that respect very shortly are given in the following extracts from the interim report of the Dominion Fuel Board, which has just been tabled in the House of Commons at Ottawa:

"The board is convinced of the importance of an investigation into the feasibility of establishing byproduct recovery coking plants in the larger centers of population. Not only are there the Nova Scotia and New Brunswick coals to draw upon but, as stated before, there are immense reserves of United States bituminous coal that could be imported for coking. Briefly, the plan would be to establish coking plants at large well-situated centers of population like Montreal and Toronto, where the coke could be manufactured and shipped to tributary territory, and the gas used at the point of manufacture.

"Other valuable byproducts, such as tar, ammonium sulphate and benzol, are obtained, and the success of such an industry depends on the disposal of these.

"The chairman of the board investigated a plant established by the cities of St. Paul and Minneapolis for the manufacture of this coke, and found that not only were the two cities above referred to being supplied but that shipments were being made to Winnipeg. More recent investigation by the board in other part of the United States, where coke is being manufactured and used for domestic purposes, have confirmed the conclusion that this should be a very fruitful field for further investigation. The board considers that developments in this connection hold out so much promise that it has by resolution placed on record its decision to employ a competent expert to report upon the matter.

## Commerce Department Catches Up on Import Statistics

The Department of Commerce has issued an announcement to the effect that the delays in compilation of the import and export statistics due to the greatly increased number of items required under the last tariff act have been overcome, and the import and the export figures are again issued coincidently at the usual time.

## Manila Using More Paint

A recent cable from Trade Commissioner J. A. Fowler of Manila says that paint sales in that section show still further improvement. The market for red lead remains slow. The overstocked condition of the white-lead market has been relieved and sales continue fair.

## Advocate Lower Freight Rate on Nitrate of Soda

The New Orleans Joint Traffic Bureau has attacked the freight rate applicable to nitrate of soda. A large portion of the nitrate of soda imported comes through the port of New Orleans. The New Orleans Traffic Bureau contends that a reasonable rate on nitrate of soda cannot exceed the rates applying on other fertilizers. In its arguments before the Interstate Commerce Commission, it attempts to establish that nitrate of soda is not an explosive and that fires that have resulted from the shipping of nitrate of soda have been negligible. It admits that twenty-four fires during the 11-year period from 1910 to 1921 have resulted from the shipping of that commodity, but that the resulting losses did not exceed $60,000. For that reason it is contended that the fire hazard is negligible. It also is argued that the railroads themselves would benefit by charging fertilizer rates on nitrate of soda, since it would stimulate its use, thereby increasing the yield of crops, which in turn would augment the tonnage available to the railroads.

## Vegetable Oil Residues Used in Netherlands Soap Trade

Vegetable oil foots and other byproducts of the refining of vegetable oils are being extensively used at present by the large soap and candle factories in the Netherlands.

The soap and candle factories are using comparatively little of the inedible tallows and inedible grease stearine which is usually the first choice in soap and candle materials. Vegetable oil residues, together with fish and whale oil, are under present conditions receiving most attention from Dutch users.

The candle and soap factories in the Netherlands, particularly the former, have very modern plants and are equipped to acidulate and concentrate these oily byproducts. The grease or acid oils resulting from this process are split again for the separation of glycerine and fatty acids, which are distilled once, twice, or three times, depending on the quality of the material and the lightness of color desired in the distilled fatty acid. The refined vegetable, whale and fish oils are also hydrogenated and used in the manufacture of soap. At present the candle factories are using to some extent a combination of any or all of these hydrogenated oils with paraffine.

## German Textile Industry Quiet

The depression in the retail and wholesale textile trade of Germany which began last February has shown improvement recently, according to a report from Dresden. However, the general condition of the textile industry in that country is described as uncertain. This is shown by the refusal of buyers to enter into obligations for the future.

# Casein May Be First of Chemical Items for Tariff Hearing

## Investigation of This Material Has Progressed Further Than Other Chemicals Under Consideration

CASEIN probably will be the first of the seven chemical items being investigated by the Tariff Commission with a view to possible changes in duty under the flexible tariff to be docketed for public hearing. The investigation into costs of production of casein at least has progressed further than that into any of the other items of the chemical schedule into which inquiries are being made.

F. W. McSparren, one of the Tariff Commission's chemical experts, has returned from Argentina, where he spent 6 weeks investigating the costs of producing casein, regarding which coated paper manufacturers of the United States have applied to the commission for a reduction in duty. Carl R. DeLong, chief of the Chemical Section, and two assistants conducted investigations into this product in Europe at the outset of their work on a number of chemical items there. Mr. DeLong will return in July with the data secured up to the time of his departure, which are expected to include all of those relating to casein. The inquiry into costs at domestic plants is well in hand.

No date has been fixed for a public hearing on casein, but it is probable that the subject will be considered by the commissioners soon. Thirty days' notice must be given of the hearing date.

C. H. Penning, a chemist of the Tariff Commission, is visiting domestic plants securing costs of logwood extract and barium dioxide in connection with the commission's inquiries into these items. Costs of production of logwood extract in Haiti have been secured, but are to be checked by a personal visit of an agent of the commission, while figures from Europe also will be secured before the hearing on this item is set.

## German Plants Coming Here

German patents and processes applied by German workmen, mechanics and chemists may be used for the development of foreign-owned factories in this country. Three prominent German bankers arrived in this country last week, who, according to press dispatches, intend to manufacture cosmetics, mouth wash, soaps, toothpaste and chemical products in the United States.

The three bankers in question are Rudolf Rosenheim, of Düsseldorf, formerly a chief executive of the banking firm of Fester & Co., a Stinnes concern; Martin Sternberg, of Sternberg & Co., a bank having headquarters in Amsterdam, and Curt Sorbeim, director of the Commercial and Private Bank in Berlin. These men have intimated to a press representative that they will not seek the support of American bankers.

## American Progress to Be Reflected in Exposition

The greater number of American chemicals and the fewer foreign items being used in the United States as compared with conditions a year ago will undoubtedly be reflected in the Chemical Exposition. Early estimates indicate that the line of "Made in America" chemicals which will be shown this year will cover a broader field than even during the most active period of the war. Equipment developments in America during the year have not been affected to such a degree as the chemicals by changed conditions in Europe, although the strides forward, which will be exhibited in September, have been large.

During June the demand for chemicals in the United States has been smaller and permitted the gradual accumulation of imported stocks here, although in practically all cases American goods are commanding a premium in price over the foreign. At the exposition in September, a birdseye view of the recent developments in the American industry which have made this condition possible, considered impossible 10 years ago by all the leading authorities, will be presented. The spirit of the new chemical America will be epitomized in the 1923 show.

## Paint Trade of Yucatan

There are no paint manufacturers in Yucatan, and the paints and varnishes used there are almost exclusively of American origin. Oil paints are used for interior and exterior finishes in both the better stone and wood houses. Water paints have a comparatively large field owing to their cheapness, ease of application and adaptability to stone interior and exterior walls.

American weights and measures are used, except in the case of products sold in bulk, such as powder, oil and other like commodities, which employ the metric system. Tins of a gallon and less are desirable for the general retail trade. There is no preference as to their shape. Containers are of the same type as those used in the United States, but the lettering should be in Spanish. No complaint has been made as to rusting of tins or other deterioration. Good packing, including waterproof lining, is desirable to withstand rough handling in the port of Progreso, and also to avoid injury to tins through accidental wetting with salt water in the unprotected harbor. There are no government regulations as to the composition and marking of paints and varnishes.

## Trade Notes

The Lyon Engineering & Construction Co., 225 Fifth Ave., New York, has issued schedules in bankruptcy with liabilities placed $16,447 and assets $26,000.

H. D. Whittlesey, vice-president and director of sales of Sherwin-Williams Co., was elected to the office of vice-president of the National Association of Sales Managers.

Production of olive oil in Italy in 1922-23 amounted to 2,891,140 quintals. Average production of oil per 100 kilos of olives was 19.18 kilos.

While the hog industry in Denmark and Poland shows complete recovery, the number of hogs in Germany is approximately 1,000,000 less than it was a year ago and about 33 per cent below the pre-war figure.

Potash salts to the extent of 4,616 tons were produced during March at the mine at Kalusz, Galician Poland.

Charles M. Mason and Henry M. Miner have been appointed temporary receivers for Wood Oils, Inc., Blanchard St., Newark, N. J. The company specializes in the production of linseed oil, with main plant at Sidell, La. New York offices are at 19 West 44th St. Edmund W. Brown is president, and Frederick T. Snyder secretary and treasurer.

Cottonseed meal trading in spot and futures will be resumed by the Memphis Merchants' Exchange Clearing Association, beginning July 1.

The annual meeting of the International Association of Seed Crushers was held in Scheveningen, Holland, June 15 and 16.

## Fertilizer Men to Gather at Storrs

Round-table discussion of fertilizer problems, especially as met in New England, is to be carried out at the second annual conference of fertilizer manufacturers and dealers. This meeting is to be held at the Connecticut Agricultural College, Storrs, Conn. Accommodations for those who spend July 11 and 12 at Storrs, the two days of the meeting, may be obtained in the quarters of the college.

The program as officially announced includes the following subjects: "Fertilizer Problems of Connecticut," E. H. Jenkins; "Significance of a Survey of Connecticut Soil Possibilities," W. L. Slate; "Economic Use of Commercial Fertilizers," J. G. Lipman; " How Can Scientific Workers and Fertilizer Men Co-operate Better to Serve the Farmer?" S. B. Haskell; "How the Farmer Looks at the Fertilizer Problem and How He Should View It," A. W. Manchester; "Field Crop Fertility Problems," J. S. Owens; "Present-Day Problems of the Industry," speaker to be announced.

## Ruhr Licenses Must Be Applied For Before July 1

The State Department has received notice from the Rhineland High Commission that American firms planning to ship goods from occupied Germany must make application for export licenses before July 1. Firms wishing to ship goods into the Ruhr also must make application for license by the end of June.

The decision of the High Commission states: "The interallied authorities may authorize the foreign seller to take the place in the application for the importation license of the defaulting German importer, in cases where the sale is the object of an order placed before Feb. 1, 1923, and more particularly where the goods have been totally or partly paid for. In cases where one of the above-mentioned conditions cannot be filled the interallied authorities may authorize special importation by way of exception."

In order to enjoy the benefit of the measures indicated the foreign seller must address an application to the interallied services concerned, as follows:

To the executive committee of licenses of the High Commission for merchandise consigned to firms located in the occupied territory, with the exception of those located at the Düsseldorf and Duisburg bridgehead and the basin of the occupied Ruhr district.

To the license department of the Factory and Mine Control Mission at Essen for merchandise consigned to firms located at the Düsseldorf and Duisburg bridgehead and in the basin of the occupied Ruhr district.

The application must be accompanied by a certificate vouching for the date of the order and the total or partial payment, if any, of the goods before February 1.

This certificate must be issued:

(*a*) If the seller belongs to one of the nations represented in the High Commission, or the interallied license department, by the representative of this nation therein.

(*b*) If the seller does not belong to one of the nations represented in the High Commission, or the interallied license department, by the diplomatic representative of his government or one of the governments represented in the interallied department.

The time in which applications will be received expires June 30, 1923, inclusive.

## Coke Production Rising

Coke production figures for May, just published by the United States Geological Survey, indicate that during that month 3,328,000 net tons were pushed from byproduct ovens. This was an increase of 122,000 tons, or 3.8 per cent, over April. Beehive production also increased, the net output amounting to 1,829,000 tons. Sixty-three of the sixty-nine plants in the country are producing at present.

## Engineering Educators Convene at Cornell

### Three Hundred Leaders Gather to Decide Lines of Endeavor

Engineering leadership and educational research were leading topics at the annual meeting of the Society for the Promotion of Engineering Education at Ithaca, N. Y., on June 20 to 23. More than three hundred leading educators from all sections expressed an enthusiastic desire to carry forward the educational research project formulated by 2 years' work of the committee of investigation and co-ordination. This calls for the investigation of the objects of engineering education and the best curriculum to attain the desired ends. A director is to be appointed, with an advisory board, and Dr. H. S. Pritchett of the Carnegie Corporation has recommended to his directors and to other foundations the expenditure of $108,000. Action is to be taken immediately by appointing a faculty committee at each school to cooperate with the director.

At the opening meeting on Wednesday afternoon Dean D. S. Kimball gave a notable address on training for leadership. He said that precedents were lacking whereby legal leadership in the nation could codify past experiences and that the present epoch utilized pure and applied science so greatly that the engineer was needed. The fundamental curriculum, he thought, should not be changed, as such a practice would undermine the standing of the engineer which has been built up over many years. Hope for solving present problems lies in the application of engineering principles by the industrially intelligent, and the present era calls for universal well-being, not private, state or corporate profits. In the opinion of Dean Kimball, the chief trouble with the present curricula as regards training leaders is that they afford no historical background. There is also an insufficient number of inspiring teachers.

Excellent arrangements were made for caring for visitors in the Cornell University building, and many entertainment features were provided for the visiting ladies. On Wednesday night President Farrand of the university welcomed the members of the society, and President C. F. Scott of the society responded, after which an informal reception was held.

## Babassu Nuts in Demand

Advices from Brazil state that there is great activity in the babassu market in the northern states of Maranhao and Piauhy. Exports of babassu nuts from Maranhao during the first 4 months of 1923 amounted to 8,500 tons, as compared with 2,000 tons during the corresponding period of 1922. The babassu nut produces a vegetable oil very similar to coconut oil but somewhat higher in free fatty acid.

## Financial Notes

The Joseph Dixon Crucible Co. has declared a regular quarterly dividend of 2 per cent, payable June 30.

Darling & Co., of Chicago, have made a bond issue loan of $1,250,000 for 20 years at 6½ per cent, for defraying construction expenses of the new grease-distillation plant at 46th and Cook Sts., Chicago.

The Ohio Leather Co., of Youngstown, O., has declared a quarterly dividend of 2 per cent on its preferred stock. This is the first dividend to be declared on the preferred stock since the financial reorganization of the company.

The A. E. Staley Mfg. Co., Decatur, Ill., manufacturer of corn products, is disposing of a bond issue of $3,000,000, a portion of the proceeds to be used for general expansion and financing. Plans are now nearing completion for the construction of a 3-story addition to the local grinding and refining plant. A. E. Staley is president.

The Pennsylvania Salt Mfg. Co. has declared a regular quarterly dividend of $1.25. An extra dividend of 50c. was declared 3 months ago.

For the first 3 months of the current year sales made by the Atlas Powder Co. were $4,901,751, an increase of about 40 per cent over same period of 1922, when sales were $3,570,833. It is estimated that business for 1923 will total more than $20,000,000, compared with $16,723,735 in 1922.

The Certain-teed Products Co. has declared regular quarterly dividends of 1¾ per cent on first and second preferred stocks, both payable July 1 to stock of record June 19.

The American Cyanamid Co. declared an initial dividend of 1 per cent on the common stock and the regular quarterly dividend of 1¾ per cent on preferred stock, both payable July 2 to stock of record June 25.

Earnings of Corn Products Refining Co. for 6 months ended June 30 are unofficially reported as showing substantial improvement over those of first half of 1922. Plants are grinding at approximately 68 per cent of capacity.

## Oil Men Will Meet in Chicago

At an executive meeting of the Oil Men's Association, held in Chicago last week, it was decided to hold the annual convention of the association at the Congress Hotel, Chicago, on Oct. 2 and 3. Walter G. Willard, formerly field secretary of the Western Petroleum Refiners Association, was chosen to succeed Melville C. Hill as secretary of the organization. Mr. Hill recently tendered his resignation in order to return to the practice of law. The change becomes effective July 1.

Facts and Figures That Influence Trade in Chemical Products

# Market Conditions

Current Prices
Imports and Exports
The Trend of Business

## Consumers and Distributors Restrict Operations in Chemicals

### Speculative Buying of Minor Importance and Manufacturing Trades Are Interested Only in Nearby Positions

THE index number shows a material decline for the week. This represents a lower price level for some chemicals, but allied products, such as cottonseed oil, linseed oil and glycerine had considerable to do in bringing down the total from the level of the preceding week.

Some of the large consuming trades are not working at capacity and this seasonable condition is felt in a diminished call for raw materials. The movement of important chemicals against contracts is very good, in fact June deliveries in some cases are larger than the totals for May. It is in new business for home and for export that the falling off in demand is most noticeable. This is especially true with reference to forward positions, as present trading is almost entirely for spot and nearby goods.

One of important features noted in the market was an announcement by a leading alkali producer that prices for soda ash and caustic soda would be on a flat basis. For many years it has been the universal custom to quote these chemicals on a basis price—48 per cent $Na_2O$ for soda ash and 60 per cent $Na_2O$ for caustic soda. The flat quotation simplifies quotations and they will be more readily understood by buyers. Attempts have been made, at intervals, to depart from the basis method of quoting, but nothing definite resulted until the present change was adopted.

Price changes were in evidence in numerous cases. Calcium arsenate, which is one of the items followed very closely at present, was disturbed by reports of offerings considerably below the levels previously held. This was in sharp contrast to views of sellers who had expected an increased demand and a hardening in prices. However, the low priced offerings were said to be restricted to a few cars and it is still too early to express a decided opinion on values for delivery over the next month. Arsenic was lower for distant positions with practically no change on spot. Nitrite of soda was easier and the same was true of nitrate of soda. Imported cyanide of soda weakened likewise. Low-priced offerings of imported copper sulphate were less in evidence and the market was firmer. Permanganate of potash also was steadier.

**Acetic Acid**—Buying has been active enough to take up the output of some sellers and stocks of the lower tests are reported to be light. Production has not been at full capacity and this has been a factor in holding supplies on a parity with consuming needs. Prices have undergone no change in the period and are quoted at \$3.38@\$3.63 for 28 per cent; \$5.48@\$5.75 for 30 per cent; and \$12@\$12.75 for glacial.

**Citric Acid**—Sales of imported were reported at 51c. per lb. and the asking prices ranged up to 52c. per lb. Advices from primary markets abroad indicate firm conditions there and shipment prices are about on a parity with the spot market. Domestic acid is still quoted at 49@50c. per lb., but the sold up condition of some producers makes their quotations purely nominal.

**Caustic Soda and Soda Ash Now Quoted on Flat Basis—Calcium Arsenate Easier—Arsenic Lower on Futures—Metal Salts Easy—Nitrite of Soda Declines—Imported Copper Sulphate Firmer—Permanganate of Potash Steadier—Prussiates Dull and Weak**

**Formic Acid**—Domestic grades are not prominent on the market as the quoted prices of 16@17c. per lb. are too high to interest buyers. Domestic production is said to be greatly curtailed owing to the low prices at which foreign material has been offered. Current quotations for imported are 12@14c. per lb. Demand has shown some improvement.

**Muriatic Acid**—The market is in a very firm position with some sellers using their output to take care of old orders. Others have only small surplus stocks. Most consumers are covered by contracts and spot business is mainly for moderate sized lots. Prices are repeated at 90c.@\$1 per 100 lb. for 18 deg., and \$1.75@\$2 for 22 deg.

**Nitric Acid**—Under a quiet trading movement the market has worked into an easy position and while no open change in prices has been announced there are reports that quotations can be shaded. Asking prices are on a basis of \$4.50@\$5 per 100 lb. for 36 deg.; \$4.75@\$5.25 for 38 deg., and \$5.25 @\$5.50 for 42 deg.

**Oxalic Acid**—The market has been easier and importers were offering freely at 13c. per lb. Domestic material also was easier and 13c. per lb. at works was the asking price. Demand is fair for small lots. Domestic production is said to be on a smaller scale.

**Sulphuric Acid**—There is not the stringency in supplies which characterized the market recently. Lessened demand has enabled producers to accumulate small stocks but good deliveries continue on contracts and values are holding on a steady level. Quotations are \$15@\$16 per ton for 66 deg. in tanks at works.

**Tartaric Acid**—Buying has failed to gain in volume to the extent importers had expected and prices are easy. Bids under quoted price levels are said to have been accepted. Quotations for imported are 35½@36c. per lb. No change has been made in domestic acid and sales are said to be going through at 37½c. per lb.

#### Potash

**Bichromate of Potash**—The quiet position of the textile and leather trades has been reflected in a slower demand for bichromate. Most first hands are holding prices at 11¼@11½c. per lb. but reports are heard to the effect that sales have been made at 11c. per lb. and it is said this is the actual trading level.

**Carbonate of Potash**—While some grades are in light supply, there is sufficient material on hand to fill buyers' wants and total sales are said to be very small. Only small lots are changing hands and with buyers out of the market, prices are not inclined to advance. Quotations are 6½@6¾c. per lb. for 80-85 per cent; 7½@7¾c. per lb. for hydrated 80-85 per cent, and 7@7¼c. per lb. for 96-98 per cent.

**Caustic Potash**—Some sellers are holding prices on a firm basis and report a strong market for imported. Buying, however, has been quiet and this has caused some holders to grant concessions and 7½c. per lb. is still quoted. Asking prices range up to 8c. per lb. with grade and seller as the reasons for the difference in quotations.

**Permanganate of Potash**—Sales of odd lots were put through at 16¾c. per lb. Distressed lots have been pretty well taken from the market and toward the close 17c. per lb. was the lowest price at which many holders would accept orders. Shipment prices are reported to be above the spot price and

this had some influence in steadying values.

**Prussiate of Potash**—Continued slow demand is reported and buyers look for concessions before taking on stocks. Views of sellers vary, but 31c. per lb. is still given as a trading basis despite the fact that others are quoting 34c. per lb. as their inside price.

### Sodas

**Bichromate of Soda**—Withdrawals against existing orders have been less persistent and this is especially true with reference to consumers in the leather industry. New business is largely restricted to small lots. Occasional lots are offered in the spot market as low as 8¼c. per lb. but first hands are maintaining quotations at 8½c. per lb. at works, with the usual premiums for smaller amounts.

**Caustic Soda**—This market has been featured by an announcement by one of the largest sellers that quotations hereafter would be on a flat basis. This supersedes the method in vogue for many years of quoting on basis 60 per cent. The new method of quoting is said to meet with favor of buyers as more or less confusion has arisen at times because of the basis price in quoting. All sellers have not adopted the flat quotation method but it is thought that the lead as set by one of the largest factors will be followed by others. The prices as now quoted are: 76 per cent solid caustic soda in 700-lb. drums, $3.16½ per 100 lb.; 76 per cent ground caustic soda in 475-lb. drums, $3.60 per 100 lb.; 575-lb. bbl., $3.85 per 100 lb.; 76 per cent flake caustic soda in 400-lb. drums, $3.00 per 100 lb., 525-lb. bbl., $3.85 per 100 lb.

**Cyanide of Soda**—Some nearby material was available at 20c. per lb. This price was for imported and shows an easier tone due to eagerness of sellers to effect sales. Demand has been rather quiet although some sellers of domestic report a good call for their product on which they quote 22@23c. per lb.

**Nitrate of Soda**—The spot market has been easy for some time. It is natural to look for a falling off in buying at this time of year and prices fluctuate according as stocks are in strong or weak hands. Recently spot offerings have been pressed for sale. The asking price is $2.45@$2.50 per 100 lb., but sales have been made under the inside figure and the market has not improved enough to hold prices steady and it is a question how much under $2.45 per 100 lb. sellers will go in order to close transactions. Some shading of the schedule price also has been noted in the case of futures especially for shipments through December.

**Nitrite of Soda**—Selling competition has been very keen with imported grades leading in price declines. Sellers of domestic generally have met the low prices quoted and have openly quoted at 7½c. per lb. works. Imported offerings were quoted at 7½@7⅝c. per lb., and on this basis the delivered price to some consuming centers favors the home-made product.

### "Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

| | |
|---|---|
| This week | 175.39 |
| Last week | 177.88 |
| June, 1918 | 272.00 |
| June, 1919 | 229.00 |
| June, 1920 | 274.00 |
| June, 1921 | 147.00 |
| June, 1922 | 157.00 |

The index number went off to the extent of 249 points. Lower prices for cottonseed and linseed oils, together with a decline in glycerine, were important factors.

**Prussiate of Soda**—Unsold stocks of imported appear to be ample and sellers on the other side are reported to be eager to make regular shipments to this market. This keeps the tone easy and it is difficult to give any price as representing sellers' views. In most quarters 15c. per lb. is said to be an inside price. Domestic grades are quoted at 16c. per lb. but are receiving scarcely any attention.

**Soda Ash**—As in the case of caustic soda, the most important occurrence in the market was the abolition of the basis price and the establishing of flat quotations by one of the largest sellers. Flat quotations are: 58 per cent light soda ash in bulk, $1.33 per 100 lb.; 300-lb. bags, $1.45 per 100 lb.; 150-lb. bags, $1.50 per 100 lb.; barrels, $1.69 per 100 lb.; 58 per cent dustless dense soda ash in bulk, $1.42 per 100 lb.; 430-lb. bags, $1.51 per 100 lb.; 430-lb. bbl., $1.75 per 100 lb.

### Miscellaneous Chemicals

**Arsenic**—The spot market shows very little change. Demand while improving a little is not heavy for this season and under the circumstances it is difficult to maintain higher price levels, although sellers seem to be more reserved. Prices heard ranged from 13½c. to 15c. per lb. depending on sellers. Futures, however, were easier and as low as 10c. per lb. was heard for the last half of the year.

**Calcium Arsenate**—While a better tone is noted in the market as a result of some improvement in demand, it is stated that orders are not coming to hand in volume sufficient to place the market in an active position. Just at present the main feature is furnished by the irregularity of prices.

Quotations heard have ranged from 12c. per lb. to 17½c. per lb. The 12c. quotation appears to have been a bona fide offer on the part of a seller who had a limited amount to sell but it is generally discredited as a real indication of the prevailing market price. However, it is stated that Southern buyers can shade 14c. per lb. delivered. Most sellers give 16c. per lb. as the open quotation. Impartial views hold prices are a matter of private negotiation between the 14c. and 16c. levels with this condition depending on the buying movement to bring about a decided price trend.

**Copper Sulphate**—Several orders for imported material at old prices could not be filled. At the close there were buyers of foreign sulphate at 4¾c. per lb., with sellers apparently firm at 5c. on spot and nearby parcels. The season of increased consumption is near at hand and this tends to support the market. Domestic material was unsettled in some directions because of the foreign competition. Prices heard ranged from 5¼@5¾c. per lb.

**Formaldehyde**—Producers generally maintained prices on the 15c. basis, but comparatively little business was put through. Scattered lots could have been picked up through second-hand channels at 14½c. per lb.

**Tin Oxide**—The market for the metal was easy and this naturally led to some talk of lower prices for tin oxide. But up to the close operators continued to quote the market at 48c. per lb. Trading was confined to small lots only.

**Sal Ammoniac**—There were offerings of the imported material at 6½c. per lb. The market was quiet and barely steady. Domestic gray, in casks, held at 8c., with the white at 7½c. per lb.

**Barium Chloride** — Offerings from abroad have increased and this unsettled prices here. There were offerings at $80@$82 per ton, carload lots.

**Fusel Oil**—The market was virtually bare of supplies and dealers refused to name a flat price. A little trading in crude developed recently around $3.75 per gal. Several small shipments arrived from abroad during the week.

## Alcohol

While trading was conducted along routine lines only, producers expect that business will soon pick up, and, with stocks not burdensome, prices were firmly maintained. In denatured alcohol producers offered the special No. 1 formula on the basis of 35c. per gal., in drums, and 41c. per gal., in barrels, carload lots. Ethyl spirits, U.S.P., 190 proof, held at $4.70@$4.75 per gal., in barrels. Butyl spirits closed unchanged at 26@27c. per gal. With production curtailed over the summer months, the market for methanol ruled steady, first-hands quoting $1.18 per gal. on the 95 per cent, and $1.20 per gal. on the 97 per cent grade.

## Italy Eases Export Bans

Export restrictions governing Italian products have been considerably relaxed since June 3, so that licenses are now required for only the following commodities: Hemp and flax waste, rags, excluding tow; wooden railroad cross ties; iron ore, except pyrites; copper, brass and bronze scrap, except turnings; iron and steel scraps; wheat, oats and uncleaned rice; cattle and fresh beef; asses; bones and metallic money. This information is contained in a report just received by cable from Commercial Attaché N. C. McLean.

For some time quite a number of commodities have been on the list of goods which are prohibited from exportation.

# Coal-Tar Products

## Benzene Unsettled in Dull Market—Synthetic Phenol Offerings Increase—Naphthalene Easier—Solvents Firm

PRODUCERS of coal-tar byproducts reported a quiet week. With the exception of solvent naphtha the market seemed to favor buyers. An easier undertone prevailed in benzene, phenol, naphthalene and the salicylates. First-hands announced no price changes, but admitted that considerable shading was possible in outside channels. Scattered lots of benzene sold at concessions, and with no improvement in the motor fuel situation, either here or abroad, supplies on hand were considered more than ample for current needs. Offerings of synthetic phenol are increasing, but the output has not yet reached the stage where producers are willing to meet the views of larger consumers, with the result that virtually no round-lot transactions are being placed. There were willing sellers of synthetic phenol for future delivery at 40c. per lb. "Regular" buyers could have obtained the natural product around 30c. per lb. deferred delivery. On spot resale parcels were offered at prices ranging from 42c. to 50c. per lb., the top figure obtaining on small lots. Crude naphthalene was offered for shipment from abroad at concessions, but so far as could be learned no buying interest developed. Refined naphthalene on spot was unsettled and slightly lower prices prevailed on odd-lot transactions. Solvent naphthas were in scanty supply and first-hands reported the market as firm with prices more or less nominal. Pure zylene was in moderate demand, and, with stocks on spot limited, prices were firmly maintained.

**Alpha-Naphthylamine** — The market was barely steady, but most producers held out for 35c. per lb., immediate shipment from works. Demand was slow.

**Aniline Oil**—Business was confined chiefly to small lots and it was possible to pick up supplies involving less than carload lots on the 16c. per lb. basis.

**Benzoic Acid**—Anticipating seasonable activity in this commodity, traders were disposed to ask higher prices. The U.S.P. grade on spot held at 77@80c. per lb., with forward material available at 72@75c. per lb., as to quantity and seller.

**Benzene** — The market developed weakness in outside channels, but leading producers refused to meet this competition. The demand has been disappointing and with no change for the better in the motor fuel situation some traders were not disposed to hold on to supplies and stood ready to cut prices in order to interest consumers. The 90 per cent grade, so far as leading producers were concerned, held at 25c. per gal., tank cars, f.o.b. works, with the pure at 27c. per gal., tank cars, f.o.b. works. Advices from Manchester, England, report quiet trading in benzene, but the price, while barely steady, settled around 1s. 7d. per gal.

**Cresylic Acid**—Prices named toward the close, on imported material, ranged from $1.05@$1.15 per gal., according to grade and seller. Business was neglected and the undertone easy. Offerings from domestic sources, for nearby delivery, have increased of late, but producers announced no price changes.

**Naphthalene**—Scattered parcels of flake sold down to 7¾c. per lb., which compares with 8c. a week ago. The demand was not sufficient to steady the market. Crude to import was offered at 2½@3¼c. per lb., the price varying according to the seller and specifications. London advices, under recent date, indicate that the market in the United Kingdom has eased off, with sellers of crude at £7@£12 per ton, the inside figure prevailing on rather low-grade material.

**Phenol**—With offerings of the synthetic product increasing, sentiment favored buyers. For spot material most traders were asking from 48@50c. per lb., but several lots came on the market at concessions and prices at the close were little more than nominal. During the week actual offerings of resale material were heard of at 42c. Second-half of 1923 business could have been negotiated at 40c. per lb. Producers of the natural product refused to name a flat price, but intimated that on contract regular customers might obtain supplies around 30c. per lb.

**Solvent Naphtha**—Demand for this material was good and with production sold well ahead the market ruled firm. Leading producers held out for 27c. per gal., tank car basis, forward delivery, f.o.b. works.

## Effects of Borax on Plant Growth

After exhaustive experiments, the U. S. Department of Agriculture claims to have proved that as little as 4 lb. of borax to the acre is detrimental to plant growth. In some instances, however, no detrimental affect was noted until borax had been applied to the extent of 20 lb. to the acre. The lengthy period of experimental work was made necessary because it damaged crops during the war, when a potash salt containing borax was used.

The experiments show that the potato can tolerate a greater quantity of borax than plants such as corn and beans, which are injured by comparatively small quantities of borax. The degree of injury, however, depends more than anything else upon the depth and distribution of rainfall.

## Standard Test Requested for Coal-Tar Distillates

Owing to confusion which has arisen because of different methods of testing the quantity of distillate in certain coal-tar products, the Customs Division of the Treasury Department will ask the United States Bureau of Standards to evolve a standard test, which will be adopted uniformly by the customs service.

The issue has been brought to the front by the complaint of an importer who brought two importations of the same product through two different ports, New York and Philadelphia. At New York, the test given at the chemical laboratory of the Customs Division showed that the product was entitled to free entry under paragraph 1549 of the 1922 tariff act. The test by the customs chemist at Philadelphia produced a different result, and there the product was declared dutiable under paragraph 27 of the act, at 55 per cent ad valorem, American selling price, and 7c. per lb. A sample of the identical lot tested at Philadelphia was submitted the Chemical Division of the Bureau of Standards, and a still different result was obtained there, placing the product practically on the borderline between free and dutiable. In each case a different method of testing was used. Final liquidation of the importations has been held up pending further investigation by the Treasury officials.

Paragraph 27 declares duitable "all distillates of coal tar, blast-furnace tar, oil-gas tar, and water-gas tar, which on being subjected to distillation yield in the portion distilling below 190 deg. C. a quantity of tar acids equal to or more than 5 per centum of the original distillate or which on being subjected to distillation yield in the portion distilling below 215 deg. C. a quantity of tar acids equal to or more than 75 per centum of the original distillate."

Paragraph 1549 declares entitled to free entry these tars and "all other distillates of any of these tars which on being subjected to distillation yield in the portion distilling below 190 deg. C. a quantity of tar acids less than 5 per centum of the original distillate."

## German Chemical Prices Firm

Chemical prices in Germany are regarded as showing remarkable firmness in the face of wild fluctuations in the mark and the rampant speculation which is honeycombing practically every German industry. It may be mentioned, however, that the stability of price apparently has not extended to the pharmaceuticals. The capital increases of the German chemical companies is proceeding merrily.

The fact that five months' dye quota has been taken at one fell swoop is expected to mean increased exports to the United States since the quantities are greater than can be digested at once in Europe.

# Vegetable Oils and Fats

## Cottonseed Oil Lower—Prompt Shipment Linseed Declines—Coconut Sells at 8¼c.—Soya Offered Freely

OFFERINGS of most oils increased, and with general unsettlement in speculative commodity markets, the undertone was easy and lower prices obtained for cottonseed, linseed, china wood, olive, oil foots and crude soya bean oil. The cottonseed statistics, which came out early last week, were regarded as bullish, but this did not inspire any confidence in the market. Lard was unsettled at the close, while in tallow the situation eased off somewhat on intimation that prospective buyers lowered their views.

**Cottonseed Oil**—Liquidation in the July option in the market for refined oil was the feature. The Bureau of Census report on cottonseed products revealed that 128,871 bbl. were consumed in May, a favorable showing considering the low position of competing fats. The visible supply on May 31 amounted to 627,000 bbl., against 707,000 bbl. on the corresponding date a year ago. (The report is reviewed elsewhere in this issue.) Speculative holdings of nearby oil in the contract market were larger than traders seemed willing to admit and fears for liberal tenders in July oil added to the unsettlement. There were numerous switches of July contracts to the September option. With cash trade slow refiners also were disposed to unload a little nearby oil. In the opinion of traders the speculative element will not operate on the long side in the old crop months, believing that the tight statistical situation has already been discounted. On the other hand the new crop is attracting widespread attention and, in the event of a 12,000,000 bale cotton crop, the sentiment at the close was rather bearish. Old crop crude was offered at 9½c. per lb., tank cars, f.o.b. Texas, with buyers at 9c. per lb. Recent business in November forward was booked at 7c. per lb., f.o.b. Texas common points, about 50 tanks moving at this figure. Bleachable oil sold at 9½c. per lb., tank cars, f.o.b. Texas, immediate shipment. Lard compound was easier at 12½c. per lb., f.o.b. New York.

**Linseed Oil**—The seed markets eased off towards the close, and with cake higher, crushers appeared a little more anxious for business. But comparatively few inquiries came out as asking prices were considered too high, especially where September forward oil was concerned. Spot oil sold at $1.08 per gal., carload lots, cooperage included, with intimation in some quarters that this figure could be shaded on early July business. On second-half of July $1.05 represented the market, with August at $1.03, carload lots, cooperage included. The lowest price heard on August forward was $1 per gal. Consumers take the stand that September forward should be selling around 90c. per gal., based on prevailing prices for seed and cake. Foreign oil weakened on lack of buying interest from America. In London spot oil, loose, closed at 43s. 6d. per cwt. (112-lb.), which compares with 45s. 6d. per cwt. a week ago. Continental demand has been slack, soapers taking to cheaper fats. A fair increase in the United States flaxseed acreage is expected and from latest reports the crop is doing well. The Canadian acreage will not be much larger than last year, according to private advices. Indian offerings continue large. According to the final official estimate production for the 1922-23 season amounted to 21,280,000 bu., which compares with 17,360,000 bu. the previous season. Argentine shipments from January 1 to June 16 amounted to 33,248,000 bu., of which total 16,612,000 bu. were shipped to the United States. Linseed cake closed steady at $37 per ton, f.a.s. New York, which compares with $34 the recent low.

**China Wood Oil**—The undertone was easier on re-sale offerings. Spot material was available at 26c. per lb. August forward shipment from the Pacific coast, in sellers' tanks, was offered at 21c. per lb.

**Coconut Oil**—The sale of 5 cars of Ceylon type oil went through at 8¼c. per lb., f.o.b. New York. On the coast 1 car sold at 8¼c., immediate shipment. Copra was steady at 4¾c. per lb., c.i.f. coast ports. England has been a buyer, supporting prices.

**Olive Oil Foots**—Spot prime green material sold at 7½@7¾c. per lb. So far as quotations went holders were asking from 7¾@8c. for spot.

**Palm Oils**—A distressed parcel of Lagos oil sold at 6¾c. per lb. Lagos for import held around 7¼c., with Niger at 6¾c. per lb., c.i.f. terms.

**Soya Bean Oil**—Prices weakened in all quarters because of the lack of buying interest. There were offerings at 9¼c. coast and 9½c. New York, sellers' tanks, nearby positions, duty paid.

**Tallow and Greases**—Last trading in extra tallow went through at 7¼c. per lb., but just before the close the undertone was easier, with offerings at 7¼c. per lb. Yellow grease was offered at 6¼c. per lb., with no buyers. Oleo stearine closed at 8¾c. asked.

## Miscellaneous Materials

**Casein**—Imported material was offered freely, and, with no improvement in the demand, prices presented a rather easy appearance. Large handlers offered the lower grades at 16@17c. per lb. In outside channels scattered lots could have been picked up at 15½c. per lb.

**Glycerine**—There were sellers of the chemically pure in the West at 15¾c. per lb., in drums, carload lots. The market in New York was unsettled at 16½@17c. per lb., in drums, the price varying according to the seller. Recent trading in dynamite was put through at 15c. per lb., in drums, carload lots, about 25 carloads being involved. At the close the market for dynamite glycerine was more or less nominal as regards prices, most holders asking from 15½@15½c. per lb., the inside figure obtaining in the Middle West. Crude soap lye, basis 80 per cent, settled at 9¾c. bid and 10c. asked, loose, carload lots, f.o.b. shipping point.

**Naval Stores**—The market went off slightly on lack of buying interest. Receipts at Southern points were liberal, but no real selling pressure developed. Spirits of turpentine closed at $1.04 per gal., but on a firm bid it was intimated that this price might be shaded. Rosins ruled steady in sympathy with the market in the South, but not much new business was put through. The "B" grade held at $5.80 per bbl.

**Rubber**—Reports on the state of the rubber trade were not so optimistic. Continental operators in crude showed no interest in the market, and with America less active on the buying side prices eased off. First latex and ribbed smoked sheets on spot were offered at 27c. per lb., with October-November-December nominal at 28c. per lb.

**Shellac**—The market was unsettled on lower cables from Calcutta. Demand was quiet and T. N. was offered ex-store at 58c. per lb. On ex-dock transactions as low as 55½c. was named during the week. Orange superfine closed at 62c. asked. Bleached, bone dry, held around 68@70c. per lb., as to position and seller.

**White Lead**—Withdrawals against existing contracts were liberal enough, but new business did not come forward in volume. Corroders offered lead pigments on the guarantee against decline basis, yet this did not stimulate business. The metal was easier in the West, but nominally unchanged in New York at 7½c. per lb. Standard dry white lead held at 9¾c. per lb., in casks, carload lot basis.

**Zinc Oxide**—Consumption of zinc oxide is likely to meet with a setback, as several of the larger tire manufacturers have announced that production will be curtailed over the summer months. However, this did not bring out an easier situation in zinc oxide and producers continued to quote on the former basis of 8c. per lb. on the American process, lead free. French process, red seal, settled at 9½c. per lb., round-lot basis. East St. Louis reported weakness in the metal, spelter closing around 5.95c. per lb.

## London Tallow Auction

At the regular weekly tallow auction, held in London, June 20, 1,441 casks were offered and 1,142 casks sold. Prices realized were unchanged to 1 shilling higher.

# Imports at the Port of New York

**June 15 to June 21**

**ACIDS — Tartaric** — 100 csk., Palermo, Order; 150 bbl., Genoa, L'Appula Soc. Amon.; 3 bbl., San Juan, Powers-Weightman & Rosengarten.

**ALCOHOL**—85 bbl. denatured, Arecibo, C. Esteva; 25 bbl. do., Arecibo, M. Feigel & Bros.

**ALIZARINE**—2 csk., Hamburg, Kuttroff, Pickhardt & Co.

**ARSENIC**—100 cs., Kobe, Irving Bank—Col. Trust Co., 15 cs., Kobe, S. W. Bridges & Co.; 50 cs., Kobe, Frazer & Co.; 200 cs., Kobe, Order.

**BLANC FIXE**—40 csk., Hamburg, P. Uhlich & Co.

**BRONZE POWDER**—92 cs., Bremen, Baer Bros.; 23 cs., Bremen, Hensel, Bruckmann & Lorbacher; 24 cs., Bremen, Uhlfelder & Co.; 8 cs., Bremen, Order.

**CAMPHOR**—350 cs., Hamburg, A. Ochse & Co.

**CASEIN**—297 bg., Bombay, Order; 333 bg., London, Bank of America; 250 bg., Hamburg, Jungmann & Co.; 134 bg., Hamburg, A. Klipstein & Co.

**CHEMICALS**—98 pkg., Bremen, Pfaltz & Bauer; 300 bg., Glasgow, Brown Bros. & Co.; 17 cs., Hamburg, Morgenstern & Co.; 50 csk., Rotterdam, Stanley Doggett; 40 csk., London, A. Klipstein & Co.; 38 pkg., Hamburg, Hummel & Robinson; 372 pkg., Hamburg, Roessler & Hasslacher Chem. Co.; 7 csk., Hamburg, Bank of the Manhattan Co.; 270 csk., Hamburg, Jungmann Co.; 19 csk, Hamburg, Order; 21 bbl., Hamburg, A. Murphy & Co.

**CHALK**—500 tons, London, Baring Bros. & Co.; 2,000 bg., Antwerp, Cooper & Cooper, Inc.; 200 bg., Antwerp, Irving Bank-Col. Trust Co.; 1,500 bg., Antwerp, Bankers Trust Co.; 115 bg., London, Order.

**CHROME ORE**—2,000 tons; Beira, E. J. Lavino & Co.

**CINCHONINE**—21 cs., Rotterdam, R. W. Greeff & Co.

**CREAM TARTAR**—50 csk., Hamburg, Order.

**COLORS**—20 cs., Bremen, Sigmund Uliman Co.; 50 csk. earth, Bremen, L. H. Butcher & Co.; 5 csk. aniline, Harve, Sandoz Chemical Works; 4 csk. do., Havre, Irving Bank-Col. Trust Co.; 27 pkg. do., Havre, Geigy Co.; 6 csk do., Havre, Carbic Color & Chemical Co.; 20 bbl., earth, Leghorn, Reichard-Coulston, Inc.; 68 bbl. do., Leghorn, Order; 16 csk. earth, Marseilles, C. F. Gledhill; 3 csk., Bremen, O. Hommel Co.; 21 csk. earth, Hamburg, P. Uhlich & Co.; 25 csk. earth, Hamburg, J. L. Smith & Co.; 34 csk. aniline, Hamburg, Kuttroff, Pickhardt & Co.; 4 csk do. Hamburg, Order; 15 csk., Hamburg, Gresselli Chem. Co.; 3 csk. do., Hamburg, Carbic Color & Chem. Co.; 4 csk. do. Hamburg, G. A. Kuhl; 7 csk. aniline, Rotterdam, H. A. Metz & Co.; 14 bbl., Hamburg, Fezandie & Sperrie.

**COPPER OXIDE**—50 dr., Hamburg, Am. Metal Co.

**COPRA**—327,000 lb., Belize, Franklin Baker Co.; 169 bg., Morant Bay, Franklin Baker Co.; 303 bg., Port Antonio, Fandrell Import Co.; 37 bg., San Juan, Order.

**DYESTUFFS**—33 csk., Naples, Irving Bank-Col. Trust Co.; 16 csk., Naples, Am. Exchange Nat'l Bank; 10 csk., Naples, Order; 5 csk., Naples, Ladenburg, Thalmann & Co.; 2 csk., Naples, Ackermann Color Co.; 7 cs., Havre, Selchow & Righter; 4 cs., Havre, R. H. Meehan & Co.; 2 cs., Havre, B. F. Drakenfeld & Co.; 4 csk., Havre, Sandoz Chem. Wks.

**FULLERS EARTH**—1250 bg., London, L. A. Salomon & Bro.

**FUSEL OIL**—21 dr., Rotterdam, G. W. Sheldon & Co.; 3 dr. Rotterdam, Order.

**GLAUBER SALT**—335 csk., Hamburg, Innis, Speiden & Co.; 200 bg., Hamburg, A. J. Marcus; 251 bbl., Hamburg, E. Suter & Co.

**GUMS**—324 bg. copal, Antwerp, Equitable Trust Co.; 200 bg. do., Antwerp, Brown Bros. & Co.; 124 cs. kauri, Auckland, Baring Bros. & Co.; 48 pkg. do., Auckland, Brown Bros. & Co.; 47 cs. do., Auckland, Equitable Trust Co.; 332 bg. do., Auckland, Am. Foreign Banking Corp.; 95 cs. do., Auckland, Guaranty Trust Co.; 122 cs. and 359 sk., Auckland, Chemical Nat'l Bank; 1204 pkg. kauri, Auckland, Order; 209 bg. yacca, Port Adelaide, Baring Bros. & Co.; 400 bg. do., Port Adelaide, W. Schall & Co.; 546 bg. ghaty, 527 bg. karaya, 259 pkg. tragacanth, 56 bg. asafoetida, 225 bg. olibanum, Bombay, Order; 290 bg. copal, Antwerp, Order; 1,400 cs. damar, Batavia, National City Bank; 200 cs. do., Batavia, Innes & Co.; 100 cs. do. Batavia, W. Schall & Co.; 200 cs. do., Batavia, Bank of Cent. & South Am.; 2,250 cs. do., Batavia Order; 487 bg. copal, Antwerp, W. Schall & Co.; 620 pkg. do. Antwerp, Central Union Trust Co.; 205 bg. do. Antwerp, Chemical National Bank; 105 bg. do. Antwerp, Brown Bros. & Co.; 26 cs. kauri, London, Order; 1,240 bg. yacca, Adelaide, International Banking Corp.; 141 bg. do., Adelaide, Order.

**IRON OXIDE**—10 csk., Marseilles, C. F. Gledhill; 200 bbl. Malaga, Scott L. Libby Corp.; 170 bbl., Malaga, C. K. Williams & Co.; 100 bbl. Malaga, E. M. & F. Waldo; 82 bbl. Malaga, J. M. Rabass; 80 bbl. Malaga, Nat'l City Bank; 110 bbl., Malaga, Reichard-Coulston, Inc.

**LITHOPONE**—300 cks., Antwerp, Benja. Moore & Co.

**LOGWOOD EXTRACT**—141 bbl., Cape Haitian, Logwood Mfg. Corp.

**MENTHOL**—25 cs. Kobe, National City Bank; 25 cs., Kobe, Stanley, Jordan & Co.

**MAGNESITE** — 104 bbl., Rotterdam, Speiden-Whitfield Co.

**MAGNESIUM**—225 cs. citrate, Naples, Order; 500 cs. do., Naples, East River Nat'l Bank.; 3 bg. chloride, Hamburg, Innis, Speiden & Co.; 150 dr. chloride, Hamburg, Order.

**MYROBALANS** — 4,000 pkt., Calcutta, Standard Bank of South Africa; 10,972 bg., Bombay, Order; 14,426 pkt., Calcutta, Order.

**OILS—Olive Oil Foots**—100 bbl., Palermo, Banca Comm. Italo; 100 bbl. Palermo, Order; 100 bbl., Patras, G. Barnalas. **Palm**—500 csk., Hamburg, African & Eastern Trading Corp. **Seal**—140 tons in bulk, St. Johns, Cook & Sevan Co.; 154 tons in bulk, St. Johns, Bowring & Co.

**OIL SEEDS—Castor**—10928 bg., Coconada, Volkart Bros.; 1426 bg., Bombay, Order; 89 bg., Port de Paix, Huttlinger & Struller. **Linseed**—28,429 bg. and 5,724,409 kilos, in bulk, Rosario, Spencer Kellogg & Sons; 102,342 bg., Rosario, Spencer Kellogg & Sons; 36,324 bg., Rosario, L. Dreyfus & Co.; 32,537 bg., San Nicolas, L. Dreyfus & Co.; 22,400 bg., Buenos Aires, Order; 17,929 bg., Bahia Blanca, L. Dreyfus & Co.; 35,392 bg., Bahia Blanca, Order; 37,316 bg., Rosario, Order; 18,813 bg., San Nicolas, Order.

**POTASSIUM SALTS**—1500 bg. muriate and 1500 bg. sulphate, Bremerhaven, Potash Imp. Corp. of Am.; 7,000 bg. muriate, Soc. Comm. des Potasses d'Alsace; 182 dr. permanganate, Hamburg, Brown Bros. & Co.; 3,000 bbl. chlorate, Hamburg, Order; 42 pkg. permanganate, Hamburg, Order; 31 bbl. hydrate, Hamburg, A. J. Marcus, Inc.; 1,000 bbl. chlorate, Hamburg, Irving Bank-Col. Trust Co.; 18 csk. carbonate, Hamburg, Peters, White & Co.; 174 dr. caustic, Hamburg, E. Suter & Co.; 225 csk nitrate, Hamburg, Kuttroff, Pickhardt & Co.

**PYRIDINE**—1 csk., Hamburg, Order.

**QUEBRACHO**—10,466 bg., Buenos Aires, Tannin Corp.; 8,524 bg., Buenos Aires, Beckman & Winthrop; 8,210 bg., Buenos Aires, Fourth Atlantic National Bank; 1,000 tons, Buenos Aires, Tannin Corp.

**SHELLAC**—750 bg., Calcutta, Order; 100 bg., and 20 cs., Calcutta, Brown Bros. & Co.; 40 cs. garnet, Calcutta, First Nat'l Bank of Boston; 300 bg., Calcutta, Chase National Bank; 100 bg., Calcutta, N. Y. Trust Co.; 100 bg., Calcutta, Mech. & Metals National Bank; 100 bg., Calcutta, Iwai & Co.; 600 bg. refuse, Calcutta, Bank of the Manhattan Co.; 100 bg., Calcutta, British Bank of South Am.; 100 chests, Calcutta, Philadelphia Nat'l Bank; 1,356 pkg., Calcutta, Order; 50 bg. garnet, Hamburg, Kasebier-Chatfield Shellac Co.; 10 cs., Rotterdam, A. Murphy & Co.

**SODIUM SALTS**—100 cs. chlorate, Genoa, A. H. Pickering & Co.; 144 cs. do., Genoa, Order; 19,562 bg. nitrate, Iquique, W. R. Grace & Co.; 2,755 bg. nitrate, Antofogasta, W. R. Grace & Co.; 33 csk. prussiate, Rotterdam, C. F. Smillie & Co.; 200 cs. cyanide, Havre, National City Bank; 216 cs. sulphite, Hamburg, C. S. Grant & Co.; 75 csk. nitrate, Hamburg, E. Suter & Co.

**STRONTIUM NITRATE**—44 bbl., Hamburg, Unexcelled Mfg. Co.

**STARCH**—1,250 bg., potato, Rotterdam, Stein, Hall & Co.; 250 bg. do., Rotterdam, J. Wertheimer & Sons; 200 bg. do., Rotterdam, Chic Starch Co.

**SUMAC**—350 bg. Palermo, American Express Co.; 550 bg., Palermo, Order.

**TALC**—3,500 bg., Genoa, Italian Discount & Trust Co.; 250 bg., Genoa, Bankers Trust Co.

**TARTAR** — 16 csk., Messina, Tartar Chem. Works.

**TARTRATE OF LIME**—231 bg., Valencia, C. Pfizer & Co.

**WAXES**—375 bg. montan, Bremen, W. Schall & Co.; 97 bg. bees, Valparaiso, Duncan, Fox & Co.; 40 cs. bees, Havre, L. A. Salomon & Bros.; 377 bg. carnauba, Cara, Int'l Acceptance Bank; 223 bg. do., Parnahyba, Lazard Freres; 979 bg. do., Parnahyba, National City Bank; 19 pkg. bees, Talcahuano, W. R. Grace & Co.; 72 bg. bees, Valparaiso, Banco Aleman Trans-Atlantic; 56 bg. do., Valparaiso, W. R. Grace & Co.; 50 bbl. beeswax, Rotterdam, Knauth, Nachod & Kuhne; 1,920 bg. paraffine, London, Order; 32 bg. bees, London, Order.

**WOOL GREASE**—75 bbl., Bremen, Hummel & Robinson Corp.

**ZINC OXIDE**—50 bbl., Antwerp, Reichard-Coulston, Inc.

**ZINC WHITE**—20 csk., Southampton, Houbigant, Inc.

## Latest Quotations on Industrial Stocks

| | Last Week | This Week |
|---|---|---|
| Air Reduction | 65 | 60⅜ |
| Allied Chem. & Dye | 69½ | 67½ |
| Allied Chem. & Dye pfd | 109½ | 108½ |
| Am. Ag. Chem. | 16 | 16 |
| Am. Ag. Chem. pfd | 43 | 40½ |
| American Cotton Oil | 7½ | 5½ |
| American Cotton Oil pfd | *16 | 14 |
| Am. Drug Synd. | 5½ | 5 |
| Am. Linseed Co. | 22⅝ | 18½ |
| Am. Linseed pfd. | 43 | 40 |
| Am. Smelting & Refining | 62½ | 57½ |
| Am. Smelting & Refining pfd. | 97½ | 97 |
| Archer-Daniels Mid. Co., w.i. | 33 | 30 |
| Atlas Powder | 170 | 165 |
| Atlas Powder (new) | .... | 54½ |
| Casein Co. of Am | *60 | *60 |
| Certain-Teed Products | *38 | *33 |
| Commercial Solvents | 30 | 29 |
| Corn Products | 131½ | 130½ |
| Corn Products pfd | 116½ | 117½ |
| Davison Chem. | 29⅞ | 30½ |
| Dow Chem. Co. | *42 | *42 |
| Du Pont de Nemours | 121⅜ | 116½ |
| Du Pont de Nemours db | 85⅜ | 85 |
| Freeport-Texas Sulphur | 13⅜ | 11 |
| Glidden Co. | 7½ | 7½ |
| Grasselli Chem. | 133 | *133 |
| Grasselli Chem. pfd. | 105 | *105 |
| Hercules Powder | 103 | *100 |
| Hercules Powder pfd | 103 | *102 |
| Heyden Chem. | 2½ | 2 |
| Int'l Ag. Chem. Co. | 4½ | 3½ |
| Int'l Ag. Chem. pfd | 14 | 10½ |
| Int'l Nickel | 14½ | 13½ |
| Int'l Nickel pfd. | 84⅜ | 82 |
| Int'l Salt | *90 | *80 |
| Mathieson Alkali | 47 | 42⅜ |
| Merck & Co. | *87 | *87 |
| National Lead | 119 | 114 |
| National Lead pfd. | 112 | 110 |
| New Jersey Zinc | 157 | 155 |
| Parke, Davis & Co | 78 | 78 |
| Pennsylvania Salt | 85 | 85 |
| Procter & Gamble | *130 | *130 |
| Sherwin-Williams | 29 | 29 |
| Sherwin-Williams pfd | *102 | *101 |
| Tenn. Copper & Chem. | 9⅜ | 8⅝ |
| Texas Gulf Sulphur | 59½ | 57 |
| Union Carbide | 56⅜ | 54½ |
| United Drug | 80½ | 80 |
| U. S. Industrial Alcohol | 54½ | 48 |
| U. S. Industrial Alcohol pfd | *102 | *100 |
| Va.-Car. Chem. Co. | 9⅜ | 8½ |
| Va.-Car. Chem. pfd | 26 | 25½ |

*Nominal. Other quotations based on last sale.

# Current Prices in the New York Market

***For Chemicals, Oils and Allied Products***

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

## General Chemicals

| | | | |
|---|---|---|---|
| Acetone, drums | lb. | $0.25 | – .25½ |
| Acid, acetic, 28%, bbl. | 100 lb. | 3.38 | – 3.50 |
| Acetic, 56%, bbl. | 100 lb. | 6.75 | – 7.00 |
| Glacial, 99½%, bbl. | 100 lb. | 12.00 | – 12.50 |
| Acetic anhydride, 85%, dr. | lb. | .38 | – .... |
| Boric, bbl. | lb. | .10½ | – |
| Citric, kegs | lb. | .49 | – .52 |
| Formic, 85% | lb. | .14 | – .16 |
| Gallic, tech. | lb. | .45 | – .50 |
| Hydrofluoric, 52%, carboys | lb. | .11 | – .12 |
| Lactic, 44%, tech., light, bbl. | lb. | .11½ | – .12 |
| 22% tech., light, bbl. | lb. | .05½ | – .06 |
| Muriatic, 18° tanks | 100 lb. | .90 | – 1.00 |
| Muriatic, 20°, tanks, | 100 lb. | 1.00 | – 1.10 |
| Nitric, 36°, carboys | lb. | .04½ | – .05 |
| Nitric, 42°, carboys | lb. | .06 | – .06½ |
| Oleum, 20%, tanks | ton | 18.50 | – 19.00 |
| Oxalic, crystals, bbl. | lb. | .13 | – .13½ |
| Phosphoric, 50% carboys | lb. | .07½ | – .08½ |
| Pyrogallic, resublimed | lb. | 1.50 | – 1.60 |
| Sulphuric, 60°, tanks | ton | 9.50 | – 11.00 |
| Sulphuric, 60°, drums | ton | 13.00 | – 14.00 |
| Sulphuric, 66°, tanks | ton | 16.00 | – 16.50 |
| Sulphuric, 66° drums | ton | 20.00 | – 21.00 |
| Tannic, U.S.P., bbl. | lb. | .65 | – .70 |
| Tannic, tech., bbl. | lb. | .45 | – .50 |
| Tartaric, imp., powd., bbl. | lb. | .35½ | – .36 |
| Tartaric, domestic, bbl. | lb. | .37½ | – .... |
| Tungstic, per lb. | lb. | 1.10 | – 1.20 |
| Alcohol, butyl, drums, f.o.b. works | lb. | .26 | – .28 |
| Alcohol ethyl (Cologne spirit), bbl. | gal. | 4.75 | – 4.95 |
| Ethyl, 190 p'f. U.S.P., bbl. | gal. | 4.70 | – .... |
| Alcohol, methyl (see Methanol) | | | |
| Alcohol, denatured, 190 proof | | | |
| No. 1, special bbl. | gal. | .41 | – ... |
| No. 1, 190 proof, special, dr. | gal. | .35 | – ... |
| No. 1, 188 proof, bbl. | gal. | .42 | – ... |
| No. 1, 188 proof, dr. | gal. | .36 | – ... |
| No. 5, 188 proof, bbl. | gal. | .40 | – ... |
| No. 5, 188 proof, dr. | gal. | .34 | – ... |
| Alum, ammonia, lump, bbl. | lb. | .03½ | – .03¾ |
| Potash, lump, bbl. | lb. | .02½ | – .03½ |
| Chrome, lump, potash, bbl. | lb. | .05½ | – .05¾ |
| Aluminum sulphate, com., bags | 100 lb. | 1.50 | – 1.65 |
| Iron free bags | lb. | .02½ | – .02½ |
| Aqua ammonia, 26°, drums | lb. | .06½ | – .07½ |
| Ammonia, anhydrous, cyl. | lb. | .30 | – .30½ |
| Ammonium carbonate, powd. casks, imported | lb. | .09½ | – .10 |
| Ammonium carbonate, powd. domestic, bbl. | lb. | .13 | – .14 |
| Ammonium nitrate, tech., casks | lb. | .10 | – .11 |
| Amyl acetate tech., drums | gal. | 3.75 | – 4.25 |
| Arsenic, white, powd., bbl. | lb. | .13½ | – .14 |
| Arsenic, red, powd., kegs | lb. | .15½ | – .16 |
| Barium carbonate, bbl. | ton | 70.00 | – 75.00 |
| Barium chloride, bbl. | ton | 80.00 | – 83.00 |
| Barium dioxide, drums | lb. | .18 | – .18½ |
| Barium nitrate, casks | .... | .08 | – .08½ |
| Blanc fixe, dry, bbl. | lb. | .04 | – .04½ |
| Bleaching powder, f.o.b. wks., drums | 100 lb. | 1.90 | – .... |
| Spot N. Y. drums | 100 lb. | 2.40 | – .... |
| Borax, bbl. | lb. | .05½ | – .05¾ |
| Bromine, cases | lb. | .28 | – .30 |
| Calcium acetate, bags | 100 lb. | 4.00 | – 4.05 |
| Calcium arsenate, dr. | lb. | .14 | – 16 |
| Calcium carbide, drums | lb. | .05½ | – .05½ |
| Calcium chloride, fused, drums | ton | 22.00 | – 23.00 |
| Gran. drums | ton | 28.00 | – 30.00 |
| Calcium phosphate, mono, bbl. | lb. | .06½ | – .07 |
| Camphor, cases | lb. | .86 | – .88 |
| Carbon bisulphide, drums | lb. | .07 | – .07½ |
| Carbon tetrachloride, drums | lb. | .09½ | – .10 |
| Chalk, precip.—domestic, light, bbl. | lb. | .04½ | – .04½ |
| Domestic, heavy, bbl. | lb. | .03½ | – .03¾ |
| Imported, light, bbl. | lb. | .04½ | – .05 |
| Chlorine, liquid, tanks, wks. | lb. | .05½ | – .05½ |
| Cylinders, 100 lb., wks. | lb. | .06 | – .06½ |
| Cylinders, 100 lb., spot | lb. | .09 | – .... |
| Chloroform, tech., drums | lb. | .35 | – .38 |
| Cobalt oxide, bbl. | lb. | 2.10 | – 2.25 |
| Copperas, bulk, f.o.b. wks. | ton | 20.00 | – 21.00 |
| Copper carbonate, bbl. | lb. | .19 | – .20 |
| Copper cyanide, drums | lb. | .47 | – .50 |
| Copper sulphate, dom., bbl., | 100 lb. | 5.50 | – 5.75 |
| Imp. bbl. | 100 lb. | 5.00 | – 5.25 |
| Cream of tartar, bbl. | lb. | .25½ | – .26½ |
| Epsom salt, dom., tech., bbl. | 100 lb. | 1.90 | – 2.15 |
| Epsom salt, imp., tech., bags | 100 lb. | .90 | – 1.00 |
| Epsom salt, U.S.P., dom., bbl. | 100 lb. | 2.50 | – 2.60 |
| Ether, U.S.P., resale, dr. | lb. | .13 | – .15 |
| Ethyl acetate, 85%, drums | gal. | .80 | – .81 |
| Ethyl acetate, pure (acetic ether, 98% to 100%) | gal. | .95 | – 1.00 |
| Formaldehyde, 40%, bbl. | lb. | $0.14½ | – $0.15 |
| Fullers earth—imp., powd., net | ton | 30.00 | – 32.00 |
| Fusel oil, ref., drums | gal. | ... | – ... |
| Fusel oil, crude, drums | gal. | 3.75 | – 4.00 |
| Glaubers salt, wks., bags | 100 lb. | 1.20 | – 1.40 |
| Glaubers salt, imp., bags | 100 lb. | .90 | – .95 |
| Glycerine, c.p., drums extra | lb. | .16½ | – .17 |
| Glycerine, dynamite, drums | lb. | .15½ | – 15½ |
| Glycerine, crude 80%, loose | lb. | .10 | – 10½ |
| Iodine, resublimed | lb. | 4.55 | – 4.65 |
| Iron oxide, red, casks | lb. | .12 | – .18 |
| Lead: | | | |
| White, basic carbonate, dry, casks | lb. | .09½ | – .10 |
| White, basic sulphate, casks | lb. | .09½ | – ... |
| White, in oil, kegs | lb. | .12½ | – .14 |
| Red, dry, casks | lb. | .11½ | – .12 |
| Red, in oil, kegs | lb. | .13½ | – .15 |
| Lead acetate, white crys., bbl. | lb. | .14 | – .14½ |
| Brown, broken, casks | lb. | .13 | – .13½ |
| Lead arsenate, powd., bbl. | lb. | .23 | – .24 |
| Lime-Hydrated, bbl. | per ton | 16.80 | – 17.00 |
| Lime, Lump, bbl. | 280 lb. | 3.63 | – 3.65 |
| Litharge, comm., casks | lb. | .10½ | – .11 |
| Lithophone, bags | lb. | .07 | – .07½ |
| in bbl. | lb. | .07½ | – .07½ |
| Magnesium carb., tech., bags | lb. | .08½ | – .08½ |
| Methanol, 95%, bbl. | gal. | 1.18 | – 1.20 |
| Methanol, 97%, bbl. | gal. | 1.20 | – 1.22 |
| Nickel salt, double, bbl. | lb. | .10½ | – .... |
| Nickel salts, single, bbl. | lb. | .11½ | – ... |
| Phosgene | .... | .60 | – .75 |
| Phosphorus, red, cases | lb. | ... | – ... |
| Phosphorus, yellow, cases | lb. | .35 | – .40 |
| Potassium bichromate, casks | lb. | .11 | – .11½ |
| Potassium bromide, gran., bbl. | lb. | .19 | – .20 |
| Potassium carbonate, 80-85%, calcined, casks | lb. | .06½ | – .06¾ |
| Potassium chlorate, powd. | lb. | .07½ | – .08 |
| Potassium cyanide, drums | lb. | .47 | – .52 |
| Potassium, first sorts, cask | lb. | .07¾ | .08 |
| Potassium hydroxide (caustic potash) drums | lb. | .07½ | – .09 |
| Potassium iodide, cases | lb. | 3.65 | – 3.75 |
| Potassium nitrate, bbl. | lb. | .06¾ | – .07½ |
| Potassium permanganate, drums | lb. | .17 | – .18 |
| Potassium prussiate, red, casks | lb. | .65 | – .67 |
| Potassium prussiate, yellow, casks | lb. | .31 | – .33 |
| Salammoniac, white, gran., casks, imported | lb. | .06½ | – .06¾ |
| Salammoniac, white, gran., bbl., domestic | lb. | .07½ | – .07¾ |
| Gray, gran., casks | lb. | .08 | – .09 |
| Salsoda, bbl. | 100 lb. | 1.20 | 1 40 |
| Salt cake (bulk) | ton | 26.00 | – 28.00 |
| Soda ash, light, 58% flat, bags, contract | 100 lb. | 1.45 | – 1.50 |
| Soda ash, light, 58%, flat, bags, resale | 100 lb. | 1 70 | – 1. 75 |
| Soda ash, dense, bags, contract, basis 58% | 100 lb. | 1.51 | – .... |
| Soda ash, dense, in bags, resale | 100 lb. | 1.85 | – 1.90 |
| Soda, caustic, 76%, solid, drums | 100 lb. | 3.16½ | – .... |
| Soda, caustic, ground and flake, contracts | 100 lb. | 3.60 | – 3.85 |
| Soda, caustic, ground and flake, resale | 100 lb. | 3.72½ | – .... |
| Sodium acetate, works, bags | lb. | .05½ | – .06½ |
| Sodium bicarbonate, bbl. | 100 lb. | 2.00 | – 2.50 |
| Sodium bichromate, casks | lb. | .08½ | – .09 |
| Sodium bisulphate (niter cake) | ton | 6.00 | – 7.00 |
| Sodium bisulphite, powd., U.S.P., bbl. | lb. | .04½ | – .04¾ |
| Sodium chlorate, kegs | lb. | .06½ | – .07 |
| Sodium chloride | long ton | 12.00 | – 13.00 |
| Sodium cyanide, cases | lb. | .20 | – .23 |
| Sodium fluoride, bbl. | lb. | $0.08½ | – $0.10½ |
| Sodium hyposulphite, bbl. | lb. | .02½ | – .03 |
| Sodium nitrite, casks | lb. | .07½ | – .07¾ |
| Sodium peroxide, powd., cases | lb. | .28 | – .30 |
| Sodium phosphate, dibasic, bbl. | lb. | .03½ | – .04 |
| Sodium prussiate, yel. drums | lb. | .14½ | – .16 |
| Sodium salicylic, drums | lb. | .47 | – .52 |
| Sodium silicate (40°, drums) | 100 lb. | .75 | – 1.15 |
| Sodium silicate (60°, drums) | 100 lb. | 1.75 | – 2.00 |
| Sodium sulphide, fused, 60-62% drums | lb. | .04½ | – .04½ |
| Sodium sulphite, crys., bbl. | lb. | .03½ | – .03¾ |
| Strontium nitrate, powd., bbl. | lb. | .12½ | – .13 |
| Sulphur chloride, yel drums | lb. | .04½ | – .05 |
| Sulphur, crude | ton | 18.00 | – 20.00 |
| At mine, bulk | ton | 16.00 | – 18.00 |
| Sulphur, flour, bag | 100 lb. | 2.25 | – 2.35 |
| Sulphur, roll, bag | 100 lb. | 2.00 | – 2.10 |
| Sulphur dioxide, liquid, cyl. | lb. | .08 | – .08½ |
| Talc—imported, bags | ton | 30.00 | – 40.00 |
| Talc—domestic powd., bags | ton | 18.00 | – 25.00 |
| Tin bichloride, bbl. | lb. | .12½ | – .13 |
| Tin oxide, bbl. | lb. | .48 | – ... |
| Tin crystals, bbl. | lb. | .34½ | – .35 |
| Zinc carbonate, bags | lb. | .14 | – .14½ |
| Zinc chloride, gran, bbl. | lb. | .06½ | – .06¾ |
| Zinc cyanide, drums | lb. | .37 | – .38 |
| Zinc oxide, , lead free, bbl. | lb. | .08 | – .08½ |
| 5% lead sulphate, bags | lb. | .07½ | – ..... |
| 10 to 35 % lead sulphate, bags | lb. | .07 | – ..... |
| French, red seal, bags | lb. | .09½ | – ..... |
| French, green seal, bags | lb. | .10½ | – ..... |
| French, white seal, bbl. | lb. | .12 | – ..... |
| Zinc sulphate, bbl. | 100 lb. | 2.50 | – 3.00 |

## Coal-Tar Products

| | | | |
|---|---|---|---|
| Alpha-naphthol, crude, bbl. | lb. | $0.62 | – $0.75 |
| Alpha-naphthol, ref., bbl. | lb. | .70 | – .80 |
| Alpha-naphthylamine, bbl. | lb. | .35 | – 37 |
| Aniline oil, drums | lb. | .16 | – .16½ |
| Aniline salts, bbl. | lb. | .23 | – .24 |
| Anthracene, 80%, drums | lb. | .75 | – 1.00 |
| Anthracene, 80%, imp., drums, duty paid | lb. | .70 | – .75 |
| Anthraquinone, 25%, paste, drums | lb. | .70 | – .75 |
| Benzaldehyde U.S.P., carboys | lb. | 1.40 | – 1.45 |
| tech, drums | lb | 75 | 80 |
| Benzene, pure, water-white, tanks and drums | gal. | .27 | – .32 |
| Benzene, 90%, tanks & drums | gal. | .25 | – .30 |
| Benzene, 90%, drums, resale | gal. | .28 | – .32 |
| Benzidine base, bbl. | lb. | .80 | – .85 |
| Benzidine sulphate, bbl. | lb. | .70 | – .75 |
| Benzoic acid, U.S.P., kegs | lb. | .75 | – 80 |
| Benzoate of soda, U.S.P., bbl. | lb. | .57 | – .65 |
| Benzyl chloride, 95-97%, ref., drums | lb. | .45 | – ... |
| Benzyl chloride, tech., drums | lb. | .30 | – ..35 |
| Beta-naphthol, tech., bbl. | lb. | .21½ | – .22½ |
| Beta-naphthylamine, tech. | lb. | .80 | – .90 |
| Cresol, U.S.P., drums | lb. | .25 | – .29 |
| Ortho-cresol, drums | lb. | .28 | – .32 |
| Cresylic acid, 97%, resale, drums | gal. | 1.15 | – 1.20 |
| 95-97%, drums, resale | gal. | 1.05 | – 1.10 |
| Dichlorbenzene, drums | lb. | .07 | – .09 |
| Diethylaniline, drums | lb. | .50 | – .60 |
| Dimethylaniline, drums | lb. | .41 | – .42 |
| Dinitrobenzene, bbl. | lb. | .19 | – .20 |
| Dinitroclorbenzenee bbl. | lb. | .22 | – .23 |
| Dinitronaphthalen, bbl. | lb. | .30 | – .32 |
| Dinitrophenol, bbl. | lb. | .35 | – .40 |
| Dinitrotoluene, bbl. | lb. | .20 | – .22 |
| Dip oil, 25%, drums | gal. | .25 | – .30 |
| Diphenylamine, bbl. | lb. | .50 | – .52 |
| H-acid, bbl. | lb. | .75 | – .80 |
| Meta-phenylenediamine, bbl. | lb | 1.00 | – 1.05 |
| Michlers ketone, bbl. | lb. | 3.00 | – 3.50 |
| Monochlorbenzene, drums | lb. | .08 | – .10 |
| Monoethylaniline, drums | lb. | .95 | – 1.10 |
| Naphthalene, flake, bbl. | lb. | .07½ | – .08 |
| Naphthalene, balls, bbl. | lb. | .08½ | – .08¾ |
| Naphthionate of soda, bbl. | lb. | .58 | – .65 |
| Naphthionic acid, crude, bbl. | lb. | .55 | – .60 |
| Nitrobenzene, drums | lb. | .10 | – .12 |
| Nitro-naphthalene, bbl. | lb. | .30 | – .35 |
| Nitro-toluene, drums | lb. | .13½ | – .14½ |
| N-W acid, bbl. | lb. | 1.25 | – 1.30 |
| Ortho-amidophenol, kegs | lb. | 2.30 | – 2.35 |
| Ortho-dichlorbenzene, drums | lb. | .17 | – .20 |
| Ortho-nitrophenol, bbl. | lb. | .90 | – .92 |
| Ortho-nitrotoluene, drums | lb. | .10 | – .12 |
| Ortho-toluidine, bbl. | lb. | .13 | – .14 |
| Para-amidophenol, base, kegs | lb. | 1.20 | – 1.30 |
| Para-amidophenol, HCl, kegs | lb. | 1.25 | – 1.35 |
| Para-dichlorbenzene, bbl. | lb. | .17 | – .20 |
| Paranitroaniline, bbl. | lb. | .70 | – .75 |
| Para-nitrotoluene, bbl. | lb. | .60 | – .65 |
| Para-phenylenediamine, bbl. | lb. | 1.45 | – 1.50 |
| Para-toluidine, bbl | lb. | .90 | – .95 |
| Phthalic anhydride, bbl. | lb. | .35 | – .38 |
| Phenol, U.S.P., resale, dr. | lb. | .42 | – .46 |
| Picric acid, bbl. | lb. | .20 | – .22 |
| Pyridine, dom., drums | gal. | nominal | |

| | | | |
|---|---|---|---|
| Pyridine, imp., drums | gal. | $4.00 – | $4.25 |
| Resorcinol, tech., kegs | lb. | 1.50 – | 1.60 |
| Resorcinol, pure, kegs | lb. | 2.25 – | .... |
| R-salt, bbl. | lb. | .55 – | .60 |
| Salicylic acid, tech., bbl. | lb. | .37 – | .42 |
| Salicylic acid, U.S.P., bbl. | lb. | .40 – | .45 |
| Solvent naphtha, water-white, tanks | gal. | .27 – | .... |
| Crude, tanks | gal. | .24 – | .... |
| Sulphanilic acid, crude, bbl. | lb. | .18 – | .20 |
| Thiocarbanilide, kegs | lb. | .35 – | .38 |
| Toluidine, kegs | lb. | 1.20 – | 1.30 |
| Toluidine, mixed, kegs | lb. | .30 – | .35 |
| Toluene, tank cars | gal. | .30 – | .35 |
| Toluene, drums | gal. | .34 – | .36 |
| Xylidines drums | lb. | .49 – | .50 |
| Xylene, pure, drums | gal. | .75 – | 1.00 |
| Xylene, com., drums | gal. | .37 – | ..... |
| Xylene, com., tanks | gal. | .32 – | ..... |

## Naval Stores

| | | | |
|---|---|---|---|
| Rosin B-D, bbl. 280 lb. | | $5.80 – | .... |
| Rosin E-I, bbl. 280 lb. | | 5.90 – | .... |
| Rosin K-N, bbl. 280 lb. | | 6.10 – | .... |
| Rosin W.G.-W.W., bbl. 280 lb. | | 6.25 – | 7.25 |
| Wood rosin, bbl. 280 lb. | | 5.90 – | 6.00 |
| Turpentine, spirits of, bbl. | gal. | 1.03 – | .... |
| Wood, steam dist., bbl. | gal. | .96 – | .... |
| Wood, dest. dist., bbl. | gal. | .65 – | .... |
| Pine tar pitch, bbl. 200 lb. | | ..... – | 6.00 |
| Tar, kiln burned, bbl. 500 lb. | | ..... – | 13.00 |
| Retort tar, bbl. 500 lb. | | ..... – | 12.00 |
| Rosin oil, first run, bbl. | gal. | .45 – | ..... |
| Rosin oil, second run, bbl. | gal. | .48 – | ..... |
| Rosin oil, third run, bbl. | gal. | .52 – | ..... |
| Pine oil, steam dist. | gal. | .70 – | ..... |
| Pine oil, pure, dest. dist. | gal. | .65 – | ..... |
| Pine tar oil, ref. | gal. | .48 – | ..... |
| Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla. | gal. | .32 – | .32½ |
| Pine tar oil, double ref., bbl. | gal. | ..... – | .75 |
| Pine tar, ref., thin, bbl. | gal. | ..... – | .25 |
| Pinewood creosote, ref., bbl. | gal. | ..... – | .52 |

## Animal Oils and Fats

| | | | |
|---|---|---|---|
| Degras, bbl. | lb. | $0.03½ – | $0.04½ |
| Grease, yellow, bbl. | lb. | .06½ – | .... |
| Lard oil, Extra No. 1, bbl. | gal. | .90 – | .92 |
| Neatsfootoil 20 deg. bbl. | gal. | 1.30 – | .... |
| No. 1, bbl. | gal. | .92 – | .94 |
| Oleo Stearine | | .08½ – | ..... |
| Red oil, distilled, d.p. bbl. | lb. | .10 – | ..... |
| Saponified, bbl. | lb. | .10 – | ..... |
| Tallow, extra, loose | lb. | .07½ – | ..... |
| Tallow oil, acidless, bbl. | gal. | .94 – | .96 |

## Vegetable Oils

| | | | |
|---|---|---|---|
| Castor oil, No. 3, bbl. | lb. | $0.14 – | ..... |
| Castor oil, No. 1, bbl. | lb | .14½ – | ..... |
| Chinawood oil, bbl. | lb. | .26 – | ..... |
| Coconut oil, Ceylon, bbl. | lb. | .09¼ – | .09½ |
| Ceylon, tanks, N.Y. | lb. | .08½ – | .08¾ |
| Coconut oil, Cochin, bbl. | lb. | .09¼ – | .10 |
| Corn oil, crude, bbl. | lb. | .12½ – | ..... |
| Crude, tanks, (f.o.b. mill) | lb. | .09¼ – | .09½ |
| Cottonseed oil, crude (f.o.b. mill), tanks | lb. | .09½ – | ..... |
| Summer yellow, bbl. | lb. | .12½ – | .12½ |
| Winter yellow, bbl. | lb. | .13 – | ..... |
| Linseed oil, raw, car lots, bbl. | gal. | 1.08 – | ..... |
| Raw, tank cars (dom.) | gal. | 1.03 – | ..... |
| Boiled, cars, bbl. (dom.) | gal. | 1.13 – | ..... |
| Olive oil, denatured, bbl. | gal. | 1.05 – | 1.10 |
| Sulphur, (foots) bbl. | lb. | .07½ – | .07½ |
| Palm, Lagos, casks | lb. | .07 – | ..... |
| Niger casks | lb. | .06½ – | ..... |
| Palm kernel, bbl. | lb. | .08½ – | .08½ |
| Peanut oil, crude, tanks (mill) | lb. | .12½ – | .13 |
| Peanut oil, refined, bbl. | lb. | .16½ – | ..... |
| Perilla, bbl | lb. | .15½ – | .15½ |
| Rapeseed oil, refined, bbl. | gal. | .78 – | ..... |
| Rapeseed oil, blown, bbl. | gal. | .85 – | ..... |
| Sesame, bbl. | lb. | .11½ – | .12 |
| Soya bean (Manchurian), bbl. | lb. | .12½ – | ..... |
| Tank, f.o.b. Pacific coast | lb. | .09½ – | .09½ |
| Tank, (f.o.b. N.Y.) | lb. | .09½ – | ..... |

## Fish Oils

| | | | |
|---|---|---|---|
| Cod, Newfoundland, bbl. | gal. | $0.70 – | $0.72 |
| Menhaden, light pressed, bbl. | gal. | .76 – | ..... |
| White bleached, bbl. | gal. | .78 – | ..... |
| Blown, bbl. | gal. | .82 – | ..... |
| Crude, tanks (f.o.b. factory) | gal. | .50 – | ..... |
| Whale No. 1 crude, tanks, coast | lb. | ..... – | ..... |
| Winter, natural, bbl. | gal. | .76 – | .78 |
| Winter, bleached, bbl. | gal. | .79 – | .80 |

## Oil Cake and Meal

| | | | |
|---|---|---|---|
| Cocoanut cake, bags | ton | $26.00 – | $28.00 |
| Copra, sun dried, bags, (c.i.f.) | lb. | .05 – | .... |
| Sun dried Pacific coast | lb. | .04½ – | .... |
| Cottonseed meal, f.o.b. mills | ton | 38.00 – | .... |
| Linseed cake, bags | ton | 37.00 – | .... |
| Linseed meal, bags | ton | 39.00 – | .... |

## Dye & Tanning Materials

| | | | |
|---|---|---|---|
| Albumen, blood, bbl. | lb. | $0.45 – | $0.50 |
| Albumen, egg, tech, kegs | lb. | .95 – | .97 |
| Cochneal, bags | lb. | .33 – | .35 |
| Cutch, Borneo, bales | lb. | .04½ – | .04¾ |
| Cutch, Rangoon, bales | lb. | .13 – | .13½ |
| Dextrine, corn, bags 100 lb. | | 3.84 – | 4.25 |
| Dextrine, gum, bags 100 lb. | | 4.14 – | 4.34 |
| Divi-divi, bags | ton | 38.00 – | 39.00 |
| Fustic, sticks | ton | 30.00 – | 35.00 |
| Fustic, chips, bags | lb. | .04 – | .05 |
| Logwood, sticks | ton | 26.00 – | 30.00 |
| Logwood, chips, bags | lb. | .02½ – | .03½ |
| Sumac, leaves, Sicily, bags | ton | 70.00 – | 72.00 |
| Sumac, ground, bags | ton | $65.00 – | $67.00 |
| Sumac, domestic, bags | ton | 40.00 – | 42.00 |
| Starch, corn, bags 100 lb. | | 3.22 – | 3.49 |
| Tapioca flour, bags | lb. | .06½ – | .07 |

## Extracts

| | | | |
|---|---|---|---|
| Archil, cone., bbl. | lb. | $0.17 – | $0.18 |
| Chestnut, 25% tannin, tanks | lb. | .02 – | .03 |
| Divi-divi, 25% tannin, bbl. | lb. | .04 – | .05 |
| Fustic, crystals, bbl. | lb. | .20 – | .22 |
| Fustic, liquid, 42°, bbl. | lb. | .08 – | .09 |
| Gambier, liq., 25% tannin, bbl. | lb. | .08 – | .09 |
| Hematine crys., bbl. | lb. | .14 – | .18 |
| Hemlock, 25% tannin, bbl. | lb. | .03½ – | .04½ |
| Hypernic, solid, drums | lb. | .24 – | .26 |
| Hypernic, liquid, 51°, bbl. | lb. | .09½ – | .10½ |
| Logwood, crys., bbl. | lb. | .17 – | .18 |
| Logwood, liq., 51°, bbl. | lb. | .08½ – | .09 |
| Quebracho, solid, 65% tannin, bbl. | lb. | .04½ – | .05 |
| Sumac, dom., 51°, bbl. | lb. | .06½ – | .07 |

## Dry Colors

| | | | |
|---|---|---|---|
| Blacks–Carbongas, bags, f.o.b. works, spot | lb. | $0.20 – | $0.24 |
| Lampblack, bbl. | lb. | .12 – | .40 |
| Mineral, bulk | ton | 35.00 – | 45.00 |
| Blues–Bronze, bbl. | lb. | .55 – | .60 |
| Prussian, bbl. | lb. | .55 – | .60 |
| Ultramarine, bbl. | lb. | .08 – | .35 |
| Browns, Sienna, Ital., bbl. | lb. | .06 – | .14 |
| Sienna, Domestic, bbl. | lb. | .03½ – | .04 |
| Umber, Turkey, bbl. | lb. | .04 – | .04½ |
| Greens–Chrome, C.P. Light, bbl | lb. | .32 – | .34 |
| Chrome, commercial, bbl. | lb. | .12 – | .12½ |
| Paris, bulk | lb. | .28 – | .30 |
| Reds, Carmine No. 40, tins | lb. | 4.50 – | 4.70 |
| Oxide red, casks | lb. | .10 – | .14 |
| Para toner, kegs | lb. | 1.00 – | 1.10 |
| Vermilion, English, bbl. | lb. | 1.30 – | 1.32 |
| Yellow, Chrome, C.P. bbls. | lb. | .21 – | .22 |
| Ocher, French, casks | lb. | .02½ – | .03 |

## Waxes

| | | | |
|---|---|---|---|
| Bayberry, bbl. | lb. | $0.30 – | $0.32 |
| Beeswax, crude, bags | lb. | .21½ – | .22½ |
| Beeswax, refined, light, bags | lb. | .32 – | .34 |
| Beeswax, pure white, cases | lb. | .40 – | .41 |
| Candellila, bags | lb. | .20½ – | .21½ |
| Carnauba, No. 1, bags | lb. | .42 – | .43 |
| No. 2, North Country, bags | lb. | .23 – | .23½ |
| No. 3, North Country, bags | lb. | .18½ – | .19 |
| Japan, cases | lb. | .15½ – | .16 |
| Montan, crude, bags | lb. | .04½ – | .04½ |
| Paraffine, crude, match, 105-110 m.p. | lb. | .04 – | .04½ |
| Crude, scale 124-126 m.p., bags | lb. | .02½ – | .03 |
| Ref., 118-120 m.p., bags | lb. | .03 – | .03½ |
| Ref., 125 m.p., bags | lb. | .03½ – | .03½ |
| Ref, 128-130 m.p., bags | lb. | .03½ – | .03½ |
| Ref., 133-135 m.p., bags | lb. | .04½ – | .04½ |
| Ref., 135-137 m.p., bags | lb. | .05½ – | .05½ |
| Stearic acid, sgle pressed, bags | lb. | .12½ – | .13 |
| Double pressed, bags | lb. | .13½ – | .13½ |
| Triple pressed, bags | lb. | .14½ – | .14½ |

## Fertilizers

| | | | |
|---|---|---|---|
| Ammonium sulphate, bulk, f.o.b. works 100 lb. | | $3.25 – | $3.30 |
| F.a.s. double bags 100 lb. | | 3.85 – | 3.90 |
| Blood, dried, bulk | unit | 4.00 – | ..... |
| Bone, raw, 3 and 50, ground | ton | 27.00 – | 30.00 |
| Fish scrap, dom., dried, wks. | unit | 3.75 – | ..... |
| Nitrate of soda, bags 100 lb. | | 2.45 – | 2.52½ |
| Tankage, high grade, f.o.b. Chicago | unit | 3.60 – | 3.70 |
| Phosphate rock, f.o.b. mines, Florida pebble, 68-72% | ton | $4.00 – | $4.50 |
| Tennessee, 78-80% | ton | 8.00 – | 8.25 |
| Potassium muriate, 80%, bags | ton | 34.55 – | ..... |
| Potassium sulphate, bags basis 90% | ton | 43.67 – | ..... |
| Double manure salt | ton | 25.72 – | ..... |
| Kainit | ton | 7.22 – | ..... |

## Crude Rubber

| | | | |
|---|---|---|---|
| Para—Upriver fine | lb. | $0.27½ – | ..... |
| Upriver coarse | lb. | .24½ – | ..... |
| Upriver caucho ball | lb. | .25½ – | ..... |
| Plantation—First latex crepe | lb. | .27 – | ..... |
| Ribbed smoked sheets | lb. | .27 – | ..... |
| Brown crepe, thin, clean | lb. | .25 – | ..... |
| Amber crepe No. 1 | lb. | .26½ – | ..... |

## Gums

| | | | |
|---|---|---|---|
| Copal, Congo, amber, bags | lb. | $0.12 – | $0.13 |
| East Indian, bold, bags | lb. | .23 – | .23½ |
| Manila, pale, bags | lb. | .20 – | .20½ |
| Pontinak, No. 1 bags | lb. | .20 – | .20½ |
| Damar, Batavia, cases | lb. | .27½ – | .28 |
| Singapore, No. 1, cases | lb. | .33 – | .33½ |
| Singapore, No. 2, cases | lb. | .22 – | .22½ |
| Kauri, No. 1, cases | lb. | .65 – | .67 |
| Ordinary chips, cases | lb. | .21 – | .22 |
| Manjak, Barbados, bags | lb. | .09 – | .09½ |

## Shellac

| | | | |
|---|---|---|---|
| Shellac, orange fine, bags | lb. | $0.60 – | ..... |
| Orange superfine, bags | lb. | .62 – | ..... |
| A. C. garnet, bags | lb. | .58 – | ..... |
| Bleached, bonedry | lb. | .70 – | ..... |
| Bleached, fresh | lb. | .58 – | ..... |
| T. N., bags | lb. | .57 – | ..... |

## Miscellaneous Materials

| | | | |
|---|---|---|---|
| Asbestos, crude No. 1, f.o.b., Quebec | sh. ton | $500.00 – | ..... |
| Asbestos, shingle, f.o.b., Quebec | sh. ton | $65.00 – | $85.00 |
| Asbestos, cement, f.o.b., Quebec | sh. ton | 20.00 – | 25.00 |
| Barytes, grd., white, f.o.b. mills, bbl. | net ton | 16.00 – | 20.00 |
| Barytes, grd., off-color, f.o.b. mills bulk | net ton | 13.00 – | 15.00 |
| Barytes, floated, f.o.b. St. Louis, bbl. | net ton | 28.00 – | ..... |
| Barytes, crude f.o.b. mines, bulk | net ton | 10.00 – | 11.00 |
| Casein, bbl., tech. | lb. | .16 – | .18 |
| China clay (kaolin) crude, f.o.b. Ga. | net ton | 7.00 – | 9.00 |
| Washed, f.o.b. Ga. | net ton | 8.00 – | 9.00 |
| Powd., f.o.b. Ga. | net ton | 14.00 – | 20.00 |
| Crude f.o.b. Va. | net ton | 8.00 – | 12.00 |
| Ground, f.o.b. Va. | net ton | 14.00 – | 20.00 |
| Imp., lump, bulk | net ton | 15.00 – | 20.00 |
| Imp., powd. | net ton | 45.00 – | 50.00 |
| Feldspar, No. 1 pottery | long ton | 6.00 – | 7.00 |
| No. 2 pottery | long ton | 4.00 – | 5.50 |
| No. 1 soap | long ton | 7.00 – | 7.50 |
| No. 1 Canadian, f.o.b. mill | long ton | 20.00 – | 22.00 |
| Graphite, Ceylon, lump, first quality, bbl. | lb. | .06½ – | ..... |
| Ceylon, chip, bbl. | lb. | .05½ – | ..... |
| High grade amorphous crude | ton | 15.00 – | 35.00 |
| Gum arabic, amber, sorts, bags | lb. | .14½ – | .15 |
| Gum tragacanth, sorts, bags | lb. | .48 – | .56 |
| No. 1, bags | lb. | 1.50 – | 1.60 |
| Kieselguhr, f.o.b. Cal. | ton | 40.00 – | 42.00 |
| F.o.b. N.Y. | ton | 50.00 – | 55.00 |
| Magnesite, crude, f.o.b. Cal. | ton | 14.00 – | 15.00 |
| Pumice stone, imp., casks | lb. | .03 – | .05 |
| Dom., lump, bbl. | lb. | .05 – | .05½ |
| Dom., ground, bbl. | lb. | .06 – | .07 |
| Silica, glass sand, f.o.b. Ind. | ton | 2.00 – | 2.50 |
| Silica, sand blast, f.o.b. Ind. | ton | 2.50 | 5.00 |
| Silica, amorphous, 250-mesh, f.o.b. Ill. | ton | 17.00 – | 17.50 |
| Silica, bldg. sand, f.o.b. Pa. | ton | 2.00 – | 2.75 |
| Soapstone, coarse, f.o.b. Vt., bags | ton | 7.00 – | 8.00 |
| Talc, 200 mesh, f.o.b., Vt., bags | ton | 6.50 – | 9.00 |
| Talc, 200 mesh, f.o.b. Ga., bags | ton | 7.00 – | 9.00 |
| Talc, 200 mesh, f.o.b. Los Angeles, bags | ton | 16.00 – | 20.00 |

## Mineral Oils

Crude, at Wells

| | | | |
|---|---|---|---|
| Pennsylvania | bbl. | $3.00 – | 3.25 |
| Corning | bbl. | 1.70 – | ..... |
| Cabell | bbl. | 1.71 – | ..... |
| Somerset | bbl. | 1.55 – | ..... |
| Illinois | bbl. | 1.97 – | ..... |
| Indiana | bbl. | 1.98 – | ..... |
| Kansas and Oklahoma, 28 deg. | bbl. | 1.20 – | ..... |
| California, 35 deg. and up | bbl. | 1.04 – | ..... |

## Gasoline, Etc.

| | | | |
|---|---|---|---|
| Motor gasoline, steel bbls. | gal. | $0.21½ – | ..... |
| Naphtha, V. M. & P. deod, steel bbls. | gal | .20½ – | ..... |
| Kerosene, ref. tank wagon | gal. | .14 – | ..... |
| Bulk, W. W. export | gal. | .07 – | ..... |
| Lubricating oils: | | | |
| Cylinder, Penn., dark | gal. | .20 – | .22 |
| Bloomless, 30@31 grav. | gal. | .18½ – | .20½ |
| Paraffin, pale | gal. | .24 – | .26 |
| Spindle, 200, pale | gal. | .21 – | .22 |
| Petrolatum, amber, bbls. | lb. | .05 – | .05½ |
| Paraffine wax (see waxes) | | | |

## Refractories

| | | |
|---|---|---|
| Bauxite brick, 56% $Al_2O_3$, f.o.b. Pittsburgh | ton | $45–50 |
| Chrome brick, f.o.b. Eastern shipping points | ton | 50–52 |
| Chrome cement, 40-50% $Cr_2O_3$ | ton | 23–27 |
| 40-45% $Cr_2O_3$, sacks, f.o.b. Eastern shipping points | ton | 23.00 |
| Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks. | 1,000 | 40–46 |
| 2nd. quality, 9-in. shapes, f.o.b. wks. | 1,000 | 36–41 |
| Magnesite brick, 9-in. straight (f.o.b. wks.) | ton | 65–68 |
| 9-in. arches, wedges and keys | ton | 80–85 |
| Scraps and splits | ton | 85 |
| Silica brick, 9-in. sizes, f.o.b. Chicago district | 1,000 | 48–50 |
| Silica brick, 9-in. sizes, f.o.b. Birmingham district | 1,000 | 48–50 |
| F.o.b. Mt. Union, Pa. | 1,000 | 42–44 |
| Silicon carbide refract. brick, 9-in. | 1,000 | 1,100.00 |

## Ferro-Alloys

| | | | |
|---|---|---|---|
| Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y. | ton | $200.00 – | $225.00 |
| Ferrochromium, per lb. of Cr, 6-8% C | lb. | .11½ – | .11¾ |
| 4-6% C | lb. | .12 – | .13 |
| Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid | gr. ton | 125.00 – | ..... |
| Spiegeleisen, 19-21% Mn. | gr. ton | 40.00 – | ..... |
| Ferromolybdenum, 50-60% Mo, per lb Mo. | lb. | 2.00 – | 2.50 |
| Ferrosilicon, 10-15% | gr. ton | 48.00 – | 50.00 |
| 50% | gr. ton | 95.00 – | ..... |
| 75% | gr. ton | 150.00 – | 160.00 |

| | | |
|---|---|---|
| Ferrotungsten, 70-80%, per lb. of W | lb. | $0.90 - $0.95 |
| Ferro-uranium, 35-50% of U. per lb. of U | lb. | 6.00 - |
| Ferrovanadium, 30-40%, per lb. of V | lb. | 3.50 - 3.75 |

## Ores and Semi-finished Products

| | | |
|---|---|---|
| Bauxite, dom. crushed, dried, f.o.b. shipping points | ton | $6.00 - $9.00 |
| Chrome ore Calif. concentrates, 50% min. $Cr_2O_3$. | ton | 22.00 - 23.00 |
| C.i.f. Atlantic seaboard | ton | 20.50 - 24.00 |
| Coke, fdry., f.o.b. ovens | ton | 5.75 - 6.25 |
| Coke, furnace, f.o.b. ovens | ton | 5.00 - 5.50 |
| Fluorspar, gravel, f.o.b. mines' Illinois | ton | 20.00 - 21.50 |
| Ilmenite, 52% $TiO_2$ | lb. | .01½- .01¾ |
| Manganese ore, 50% Mn, c.i.f. Atlantic seaport | unit | .35 - |
| Manganese ore, chemical ($MnO_2$) | ton | 80.00 - 85.00 |
| Molybdenite, 85% $MoS_2$, per lb. $MoS_2$, N. Y. | lb. | .65 - .70 |
| Monazite, per unit of $ThO_2$, c.i.f., Atl. seaport | lb. | .06 - .08 |
| Pyrites, Span., fines, c.i.f. Atl. seaport | unit | .11½- .12 |
| Pyrites, Span., furnace size, c.i.f. Atl. seaport | unit | .11½- .12 |
| Pyrites, dom. fines, f.o.b. mines, Ga. | unit | .12 |
| Rutile, 95% $TiO_2$ | lb. | .12 - |
| Tungsten, scheelite, 60% $WO_3$ and over, per unit $WO_3$ | unit | 8.50- 8.75 |
| Tungsten, wolframite, 60% $WO_3$ and over, per unit $WO_3$ | unit | 8.00 - 8.25 |
| Uranium ore (carnotite) per lb. of $U_3O_8$ | lb. | 3.50 - 3.75 |
| Uranium oxide, 96% per lb. $U_3O_8$ | lb. | 2.25 - 2.50 |
| Vanadium pentoxide, 99% | lb. | 12.00 - 14.00 |
| Vanadium ore, per lb. $V_2O_5$ | lb. | 1.00 - |
| Zircon, washed, iron free, f.o.b. Pablo, Fla. | lb. | .04½- .13 |

## Non-Ferrous Materials

| | Cents per Lb |
|---|---|
| Copper, electrolytic | 14½-14¾ |
| Aluminum, 98 to 99% | 26-27½ |
| Antimony, wholesale, Chinese and Japanese | 6½- 7½ |
| Nickel, virgin metal | 27-29 |
| Nickel, ingot and shot | 30-32 |
| Monel metal, shot and blocks | 32.00 |
| Monel metal, ingots | 38.00 |
| Monel metal, sheet bars | 45.00 |
| Tin, 5-ton lots, Straits | 40.25 |
| Lead, New York, spot | 7.25 |
| Lead, E. St. Louis, spot | 6.92½ |
| Zinc, spot, New York | 6.30 |
| Zinc, spot, E. St. Louis | 5.95 |

## Other Metals

| | | |
|---|---|---|
| Silver (commercial) | oz. | $0.65¼ |
| Cadmium | lb. | 1.00 |
| Bismuth (500 lb. lots) | lb. | 2.55 |
| Cobalt | lb. | 3.25-3.75 |
| Magnesium, ingots, 99% | lb. | 1.25- |
| Platinum | oz. | 116.00 |
| Iridium | oz. | 275.00@300.00 |
| Palladium | oz. | 80.00 |
| Mercury | 75 lb. | 68.00 |

## Finished Metal Products

| | Warehouse Price Cents per Lb. |
|---|---|
| Copper sheets, hot rolled | 24.25 |
| Copper bottoms | 29.75 |
| Copper rods | 25.25 |
| High brass wire | 19 37½ |
| High brass rods | 17.00 |
| Low brass wire | 21.10 |
| Low brass rods | 22.00 |
| Brazed brass tubing | 24.25 |
| Brazed bronze tubing | 29.00 |
| Seamless copper tubing | 25.25 |
| Seamless high brass tubing | 23.50 |

**OLD METALS**—The following are the dealers' purchasing prices in cents per pound:

| | |
|---|---|
| Copper, heavy and crucible | 11.60@11.8 |
| Copper, heavy and wire | 11.50@11.6 |
| Copper, light and bottoms | 10.00@10.1 |
| Lead, heavy | 5.75@ 6.0 |
| Lead, tea | 3.50@ 3.7 |
| Brass, heavy | 6.50@ 6.7 |
| Brass, light | 5.75@ 6.0 |
| No. 1 yellow brass turnings | 6.75@ .70 |
| Zinc | 3.75@ 4.2 |

## Structural Material

**The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:**

| | New York | Chicago |
|---|---|---|
| Structural shapes | $3.29 | $3.14 |
| Soft steel bars | 3.19 | 3.04 |
| Soft steel bar shapes | 3.19 | 3.04 |
| Soft steel bands | 3.29 | 3.19 |
| Plates, ¼ to 1 in. thick | 3.29 | 3.14 |

# Industrial

Financial, Construction and Manufacturing News

# Construction and Operation

## Arkansas

RUDY—The Fort Smith Fertilizer Co., Fort Smith, Ark., has leased a local tract of land, comprising about 40 acres, as a site for the construction of a new phosphate-fertilizer manufacturing plant, estimated to cost close to $100,000, with machinery. It is purposed to develop an output of 1,000 tons per day.

SUMMIT—The Thompson Paint & Color Co. is completing the erection of the first unit of a new plant at Summit, near Yellville, and plans to commence production at an early date. It will be devoted to paint, varnish and kindred manufacture. It is planned to make extensions at a later date.

EL DORADO—The Lion Oil & Refining Co. has tentative plans for the construction of an addition to its refinery for considerable increase in capacity. E. C. Winters is one of the heads of the company.

## California

ORO GRANDE—The Riverside Portland Cement Co., Riverside, Calif., has acquired the plant and property of the Golden State Portland Cement Co., Oro Grande, near Victorville, for a consideration said to be $1,500,000. The new owner has plans in progress to increase the capacity of the mill from 1,200 to 3,600 bbl. per day, with cost estimated at close to $500,000, including machinery.

SALINAS—E. M. Galli, Hollister, Calif., operating a local plant for the manufacture of concrete pipe and kindred products, has acquired property on Market St., Salinas, as a site for a new branch plant, for which plans will be prepared at an early date. Joseph Cassi is also interested in the company.

LOS ANGELES—The Pan-American Petroleum & Transport Co. is perfecting plans for the construction of its proposed oil-refining plant on tract of land at Wilmington, in the harbor section, recently acquired. The initial plant will be equipped for a capacity of 12,500 bbl. per day, and is estimated to cost in excess of $2,000,000, with machinery. A second plant unit of like size will be built at a later date. E. L. Doheny heads the company.

## Florida

FORT PIERCE—The Non-Acid Fertilizer & Chemical Co. has tentative plans under consideration for the construction of a local plant for the manufacture of commercial fertilizer, estimated to cost close to $100,000, with machinery. E. D. Noe is one of the heads of the company.

## Georgia

SAVANNAH—The Southern Cotton Oil Co. has preliminary plans for extensions and improvements at its local plant, estimated to cost close to $75,000, including equipment.

## Illinois

CHICAGO—The Gutmann Tanning Co., 1511 Webster St., has filed plans for the erection of its proposed new tanning plant at 2128-40 Dominick St., 100x150 ft., estimated to cost $150,000, with equipment. The general contract has been let to J. Kalchbrenner, 133 West Washington St.

CICERO—The Barrett Co., 12 South La Salle St., Chicago, has completed plans and will soon commence the erection of a new side addition at its varnish-manufacturing plant at 16th St. and 51st Ave. H. A. Mulder, 140 South Dearborn St., Chicago is architect.

## Indiana

WHITING—The Standard Oil Co. of Indiana, Indianapolis, is reported to be planning for extensions in its local refining plant, with installation of additional equipment for increase in output.

## Kansas

BAXTER SPRINGS—The Uterpe Mines Co., operating local properties, has tentative plans under consideration for the rebuilding of the portion of its zinc concentration plant, destroyed by fire, June 7, with loss estimated at $100,000, including machinery.

## Kentucky

LOUISVILLE—The Van Camp Packing Co., 1303 Shelby St., has had plans prepared for the construction of a new 3-story and basement oil refining plant, 86x120 ft., estimated to cost $150,000, with equipment. Fred Erhart, Norton Bldg., is architect. J. E. Garvin is secretary.

## Louisiana

MONROE—The Consolidated Carbon Co., recently organized, has preliminary plans under consideration for the construction of a new local plant for the production of carbon black. C. A. Barbour and C. L. Kerr, both of Houston, Tex., head the company.

## Massachusetts

CHARLESTOWN—The Eastern Salt Co., 237 State St., Boston, has awarded a general contract to the William M. Bailey Co., 88 Broad St., Boston, for the erection of a new addition to its plant on Chelsea St., Charlestown, to cost about $30,000.

CAMBRIDGE—The Dewey & Almy Chemical Co., Harvey St., has filed plans for the construction of a new 1-story building at its plant.

FALL RIVER—The New England Oil Co. will make extensions in its local refining plant on New St., for the installation of additional agitating equipment, estimated to cost $35,000.

## Michigan

HAMTRAMCK—The Detroit Foundry Co., 2642 East Grand Blvd., Detroit, has tentative plans under consideration for the construction of a new 1-story foundry on Christopher St., Hamtramck. Frank Bronley is treasurer.

## Mississippi

WEST POINT—The Kill Kraw Co., recently formed with a capital of $25,000, has preliminary plans under advisement for the establishment of a local plant for the manufacture of chemical specialties for insect elimination. The new company is headed by B. H. Strong, West Point; and E. P. Bush, Macon, Miss.

## Missouri

HILLSBORO—The Eagle Picher Lead Co. is considering plans for the rebuilding of the portion of its local smelting plant, destroyed by fire, June 10, with loss estimated in excess of $150,000, including equipment. Headquarters of the company are at 208 South La Salle St., Chicago, Ill.

ST. JOSEPH—The Marland Refining Co., Ponca City, Okla., has selected a site on 4th St. for the erection of a new branch storage and distributing plant to cost about $60,000, with equipment.

## New Jersey

GARFIELD—The local plant of the Smith Rubber & Tire Co., bankrupt, has been acquired by the Magnum Rubber Products Corp., recently formed under Delaware laws with capital of $21,000,000. The new owner will take over the plant at once, and will make extensions and betterments. Operations will soon be commenced for the manufacture of automobile tires and other rubber products.

MALAPARDIS—The Manhattan Rubber Mfg. Co., 120 Broadway, New York, manufacturer of mechanical rubber goods, has plans for the construction of an addition to its crude rubber mill at Malapardis, near Morristown, including improvements in different departments of the present works.

ELIZABETH—The Consumers' Service Stations Consolidated, 90 West St., New York,

is planning for the construction of a new oil-blending plant at its property at Bay Way, Elizabeth.

TRENTON—Fire, June 11, destroyed a portion of the mechanical drying department and other sections of the plant of the Certain-teed Products Co., East State St., manufacturer of roofing products, etc., with loss estimated at $250,000. It is planned to rebuild. Headquarters of the company are at 233 Broadway, New York.

## New York

BROOKLYN—The Muller Brothers Paper Co., Prospect Ave., Ridgewood section, has completed plans for the erection of a 1-story addition to its plant, 50x90 ft. Work will be started at once.

BUFFALO—The Niagara Falls Smelting & Refining Co., recently organized, will operate a local plant at 1070-84 Niagara St. for the production of brass and bronze ingots, special alloys, etc. Ernest G. Jarvis is vice-president and general manager.

LEROY—Fire, June 14, destroyed a number of buildings at the plant of the Union Explosives Co. An official estimate of loss has not been made. It is planned to rebuild.

BUFFALO—The United States Leather Corp. of Delaware has construction under way on a new plant at Lovejoy St. and the city line, where a tract of 5½ acres of land was acquired recently from J. F. Schoellkopf. The new plant will be used for the manufacture of synthetic leather products. The company is now operating at Cleveland, O., and will remove this plant to the Buffalo site, installing considerable additional equipment for increased output.

TONAWANDA—The Standard Oil Co. of New York, 26 Broadway, New York, has acquired a tract of property in the vicinity of Stark St., and will use the site for the erection of a new oil storage, blending and distributing plant, estimated to cost in excess of $100,000, with equipment.

BROOKLYN—Edelstein & Dundy, Inc., 1831 Douglass St., manufacturer of glass products, has had plans completed for the erection of a new 1-story building, 50x100 ft., at 1875-79 Douglass St., estimated to cost $25,000. S. Millman & Son, 1780 Pitkin Ave., are architects.

## Ohio

EAST TOLEDO—The Libbey-Owens Sheet Glass Co., Nicholas Bldg., Toledo, has completed plans and will soon award contracts for the erection of a new plant on a tract of 115 acres of land at East Toledo. It will consist of a number of buildings, estimated to cost close to $4,500,000, with machinery. E. D. Libbey is president.

ALLIANCE—The Alliance Vitreous China Co., has commenced the construction of additions in its plant for considerable increase in capacity. The company is operated by the George H. Bowman Co., Euclid Ave., Cleveland.

## Pennsylvania

ORELAND—The Philadelphia Suburban Gas & Electric Co., West Washington Sq., Philadelphia, will commence the construction of a new artificial gas plant on local site, totaling 14 acres of land, estimated to cost $1,500,000, with machinery.

## Texas

MINERAL WELLS—The Palo Pinto Oil & Refining Co., recently organized to take over and operate the local refinery of the Brazos Gasoline Co., has plans under way for the construction of an addition to the plant for the production of gasoline and byproducts. The expansion is estimated to cost in excess of $50,000, with equipment.

HASKINS MOUND—The Freeport Sulphur Co. is occupying its new local plant recently completed at a cost of close to $2,000,000, and plans for extensive operations. It is purposed to develop an output of about 1,000 tons per day, and this will be extended at a later date.

EASTLAND—The Continental Gasoline Co. is being organized by officials of the Gordon Petroleum Co. to construct and operate a local plant for gasoline production. A site has been selected for the new refinery on the Caudle lease of the parent organization. It is estimated to cost close to $100,000, with equipment. Colonel Robert D. Gordon, president of the Gordon company, will also be head of the new organization.

## Washington

VANCOUVER—The Columbia River Paper Mills Co. is arranging for the immediate erection of additions to its plant, including acid towers at the sulphite mill, and the installation of equipment in other departments.

VANCOUVER—The Columbia Terra Cotta Co. has work in progress on a new local plant and will arrange for the equipment installation at an early date. A number of kilns will be built.

## West Virginia

HUNTINGTON—The Ford Block Co., Ashland, Ky., manufacturer of cement blocks and kindred products, is considering plans for the erection of a new branch plant, estimated to cost about $30,000. A site is being selected. E. A. Ford is general manager.

MOUNDSVILLE—The Kerr Portland Cement Co., Wheeling, recently organized, has selected a site at Beech Bottom, near Moundsville, for the construction of a new cement-manufacturing plant. The initial mill will consist of a number of buildings, equipped for an output of about 3,000 bbl. per day. The plant is estimated to cost in excess of $1,000,000, with machinery, and will give employment to more than 400 men. It is expected to have the mill ready for service in about 12 months.

HUNTINGTON—The National Ultramarine Co., recently organized by local interests, has tentative plans under advisement for the construction of a plant for the manufacture of colors, dyes, chemicals, etc. A site is being considered at North Cincinnati, O. The initial works will cost close to $200,000, with equipment. The new company is headed by U. S. C. Anderson, Huntington, district manager for the Columbia National Life Insurance Co. Ralph Baugher, Huntington, is chemical engineer.

## Wisconsin

WAUKEGAN—The American Lakes Paper Co., recently organized, has acquired a 4-story building at the Waukegan terminal for a consideration said to be $150,000, and has plans for the immediate establishment of a plant for the manufacture of paper products. C. C. Hockley, Appleton, Wis., heads the new company.

# New Companies

PAPER PRODUCTS CO., 105 West Monroe St., Chicago, Ill.; paper products; $40,000. Incorporators: Thomas Munro, Elma Dehne and Arthur A. Aggerbeck.

STANDARD PIGMENT CO., Hudson Falls, N. Y.; chemicals, pigments, etc.; $10,000. Incorporators: J. J. McCabe, P. Paris and W. A. Huppuch. Representative: W. L. Sawyer, Hudson Falls.

LORD & OLIVER MFG. CO., Newark, N. J.; polishing compounds, chemicals, etc.; $100,000. Incorporators: James Lord, Reubin S. Oliver and John Goetsch. Representatives: William and Benjamin Harris, 780 Broad St., Newark.

ATLAS CLAY PRODUCTS CO., Madisonville, Ky.; pipe, blocks, etc.; organized. N. M. Mitchell and A. F. Fox, both of Madisonville, head the company.

CENTRAL BRASS & ALUMINUM FOUNDRY CO., Cincinnati, O.; brass, bronze, aluminum and other metal castings; $15,000. Incorporators: Eldon L. Cunningham and Edward M. Boland, both of Cincinnati.

ALUMINATE CEMENT CO., Philadelphia, Pa.; cement products; $15,000. Representative: Corporation Guarantee & Trust Co., Land Title Bldg., Philadelphia.

BER-TAN LEATHER CO., Lynn, Mass.; leather tanning; $50,000. Charles V. McManus, president and Benjamin P. Crowell, 7 Berkshire St., Worcester, Mass., treasurer.

MILFORD OIL CO., Irvine, Ky.; refined oil products; $30,000. Incorporators: D. B. Smith, A. M. Clark and O. W. Swofford, all of Irvine.

NO-JEL PROCESS CO., New York, N. Y.; petroleum products, etc.; $50,000. Incorporators: W. C. Packard, C. T. Flach and S. C. Koff. Representative: Shaw & Flach, 256 Broadway, New York.

E. J. MCCORMICK RUBBER CO., INC., Lodi, N. J.; rubber products; $25,000. Incorporators: William Bal, Albert H. Robinson and James J. Govey, Lodi. The last noted is representative.

AKIN-SHI-NALL CO., Charlotte, N. C.; chemicals and chemical byproducts; $100,000. Incorporators: L. W. Wingate, A. M. Akin and R. F. Stroup, all of Charlotte.

RICHARDS MFG. CO., New Haven, Conn.; pottery and kindred products; $50,000. Incorporators: Ray and Samuel Segaloff, and H. R. Coshner, 37 Bedford Ave., Hamden, Conn.

CLEAN PETROLEUM CO., Wilmington, Del.; petroleum products; $500,000. Representative: Corporation Service Co., Equitable Bldg., Wilmington.

COLUMBIA LEATHER CORP., Boston, Mass.; leather products; $75,000. William A. Spaulding, Chestnut Hill, Boston, is president and treasurer.

NO-WORRY CHEMICAL CO., Newark, N. J.; chemicals and chemical byproducts; $50,000. Incorporators: Vito Rinaldi and M. Costelli. Representative: C. W. Vail, 810 Broad St., Newark.

BARIUM REDUCTION CORP., New York, N. Y.; chemicals and affiliated products; $1,500,000. Incorporators: Robinson B. Kissell, G. Herbert Timber and George C. Barclay. Representative: United States Corporation Co., 65 Cedar St., New York.

GRAHAM GLASS CO., Evansville, Ind.; glass products; $500,000. Incorporators: William P. Rus, J. M. Lentz and John A. Merchant, all of Evansville.

TENNESSEE CARBONIC CO., Nashville, Tenn.; carbonic acid gas, etc.; $75,000. Incorporators: John S. Pope, J. B. Regen and John T. Hays, all of Nashville.

HENDERSON LEATHER CO., Brooklyn, N.Y.; leather products; $50,000. Incorporators: E. and H. Henderson, and I. Herman. Representative: Greenspan & Morris, 305 Broadway, New York.

CONSUMERS' ASBESTOS ROOFING CO., 422 North Sacramento Ave., Chicago, Ill.; asbestos products; $30,000. Incorporators: William G. Murray, B. T. McCanna and Eugene T. Sullivan.

LUXOR LTD., Portland, Me.; soaps, washing powders, etc.; $10,000. Incorporators: M. G. O'Neil and A. B. Farnham, Portland; and M. F. Foster, South Portland.

TRI-SOLVENT CO., INC., Perth Amboy, N. J.; cleansing powders, water softeners, etc.; $25,000. Incorporators: Gardner Stewart, John Ingle and John W. Collopy. Representative: Arden B. Cline, 305 Front St., Perth Amboy.

# Industrial Notes

THE LINK-BELT CO., of Chicago and Philadelphia, announces that L. M. Dalton has succeeded E. J. Burnell as manager of the Boston branch office. Mr. Burnell resigned to enter business for himself. Announcement is also made that the Cleveland office of the Link-Belt Co. is now located at 329 Rockefeller Bldg.

THE CONVEYORS CORP. OF AMERICA, Chicago, announces that the Grindley Co., 1158 Homer St., Vancouver, B. C., is handling the sale of its products in the province of British Columbia. The Grindley Co. was the Western office of Gorman, Ltd., of Edmonton, and operated under that name up to May 1, but after that date Mr. Grindley took over the business, organized his own company and enlarged his selling staff. J. H. Sinclair is associated with him.

THE TROPENAS CO. has moved its general offices to 2236 Cunard Bldg., 25 Broadway, New York City. The general South American headquarters will remain at Sala No. 119, Avenida Rio Branco No. 9, Rio de Janeiro, Brazil.

# Opportunities in the Foreign Trade

***Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.***

CHEMICALS. Rio de Janeiro, Brazil. Purchase or agency.—6831.

DEXTRINES AND INDUSTRIAL STARCHES. Barcelona, Spain. Agency.—6809.

PAINTS, MARINE. Vigo, Spain. Purchase.—6868.

PAINTS AND VARNISHES. Barcelona, Spain. Purchase and agency.—6876.

SULPHATE OF AMMONIA AND POTASSIUM CARBONATE. Valencia, Spain. Agency.—6808.

TURPENTINE, ROSIN AND CAUSTIC SODA. Milan, Italy. Purchase.—6854.

MANGANESE ORE. Bombay, India. Purchase.—6849.

GASOLINE. Warsaw, Poland. Purchase and agency.—6815.

# SEARCHLIGHT SECTION

## EMPLOYMENT-BUSINESS OPPORTUNITIES-EQUIPMENT

**UNDISPLAYED—RATE PER WORD:**

*Positions Wanted*, 4 cents a word, minimum 75 cents an insertion, payable in advance.

*Positions Vacant* and all other classifications, 5 cents a word, minimum charge $2.00.

*Proposals*, 40 cents a line an insertion.

**INFORMATION:**

*Box Numbers* in care of any of our offices count 10 words additional in undisplayed ads.

*Discount* of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

**DISPLAYED—RATE PER INCH:**

1 to 3 inches.....$4.50 an inch
4 to 7 inches..... 4.30 an inch
8 to 15 inches..... 4.10 an inch

*An advertising inch* is measured vertically on one column, 3 columns—30 inches—to a page.

C. & M. E.

### POSITIONS VACANT

GRADUATE chemical engineer wanted for work in control department in metallurgical plant in the South. Answer in own hand-writing giving references. P-455, Chem. & Met. Engrg., Leader-News Bldg., Cleveland, Ohio.

MASTER mechanic, about 35 years of age, married, for a chemical industry located in Baltimore, Md. References required. P-447, Chem. & Met. Engrg., Real Estate Trust Bldg., Phila., Pa.

OPERATING superintendent wanted for wet process cement plant. Cement experience desirable but not essential. Technical graduate preferred. Proven ability to handle men required. Position offers excellent opportunity for permanent employment with increasing compensation. In reply give full details of experience, age, education, family, etc. P-454, Chem. & Met. Engrg., 10th Ave. at 36th St., New York.

TRAINED factory superintendent to take charge of insecticide factory. Must have had actual factory experience in the manufacture of arsenate of lead and calcium arsenate. P-449, Chem. & Met. Engrg., Real Estate Trust Bldg., Phila., Pa.

### POSITIONS WANTED

CHEMICAL engineer, M. S., graduate M. I. T. and School of Chemical Engineering Practice. Two years' experience, analytical, research, plant tests. Desires position with future in research development, or production. Excellent training, chemical engineering, industrial chemistry, applied colloidal chemistry. 26, married. PW-424, Chem. & Met. Engrg., 10th Ave. at 36th St., New York.

CHEMICAL engineer, twenty-four, Columbia graduate, one year's experience in manufacturing fine and pharmaceutical chemicals, desires plant, laboratory or executive position. PW-431, Chem. & Met. Engrg., 10th Ave. at 36th St., New York.

CHEMICAL engineer, twenty-five, Mass. Institute of Technology School, chemical engineering practice. Experience in heavy chemicals, paper, steel, sugar, precious metals. Desires chemical investigation or development work with future. PW-446, Chem. & Met. Engrg., Old Colony Bldg., Chicago, Ill.

CHEMICAL and metallurgical engineer, M. S. three years' experience in plant development, teaching and research, in coal, coke, byproducts and oils. Married, 27, desires position plant development or research. PW-453, Chem. & Met. Engrg., 10th Ave. at 36th St., New York.

CHEMIST, 31, eight years' laboratory and plant experience; chemical plant research, development and operation. PW-448, Chem. & Met. Engrg., 10th Ave. at 36th St., New York.

### In Replying to "Blind" Ads

be careful to put on envelope the key number in the ad and also local address of office to which reply is sent.

10th Ave. at 36th St., New York.
509 Real Estate Trust Bldg., Phila.
533 Leader-News Bldg., Cleveland.
1570 Old Colony Bldg., Chicago.
531 Rialto Bldg., San Francisco.

### Important

Original letters of recommendation or other papers of value should not be enclosed to unknown correspondents — send copies.

0195

### POSITIONS WANTED

CHEMIST wishes position with research or executive opportunity. Eight years' broad experience, experimental, analytical, plant. Five years chief chemist large plant. Degree in chemical engineering. Capable of taking charge of technical department. PW-458, Chem. & Met. Engrg., 10th Ave. at 36th St., New York.

GRADUATE chemist 5 years' experience (2 years general analytical; 2 years plant control in manufacture of inorganic salts; 1 year as superintendent in organic manufacturing plant). Married. Absolutely reliable. Mechanical ability. PW-456, Chem. & Met. Engrg., 10th Ave. at 36th St., New York.

### SALESMEN WANTED

**Sales Engineer Wanted**

Firm located New York City manufacturing non-ferrous and semi-precious alloys desires to get in touch with sales engineer who can personally introduce these alloys to the trade. Address SW-457, Chem. & Met. Engrg., 10th Ave. at 36th St., New York.

### SALESMEN AVAILABLE

SALES executive or salesman, chemical engineer, twenty-seven, broad technical and real sales experience in wide variety of industries, pyroxylin plastics and solutions, rubber and accelerators, fuel, paint and varnish, solvents and related fields, seeks unusual business opportunity. SA-451, Chem. & Met., 10th Ave. at 36th St., New York.

### BOOKS AND PERIODICALS

**Wanted**

One Copy "Magnetic Induction in Iron and Other Materials," by J. A. Ewing. BP-439, Chem. & Met. Engrg., 10th Ave. at 36th St., New York.

### OFFICIAL PROPOSALS

Bids: June 29.

**Chlorine**

Hammond, Ind.

SEALED PROPOSALS will be received at the Office of the Board of Public Works, Water Department, of Hammond, Indiana, until 2 o'clock Central Standard Time, on the 29th day of June, 1923, to furnish entire requirements of Liquid Chlorine to the City of Hammond, Water Department, for a period of one year from the date of the signing, and approval of the Contract by the Board of Public Works.

Approximately 30,000 to 40,000 pounds of Chlorine will be used during the year.

Bids will be publicly opened, read and scheduled and the Contract awarded as soon thereafter as practicable.

The Board of Public Works reserves the right to reject any or all bids and to waive technical defects in a proposal advantageous to the City of Hammond.

A. J. SWANSON,
JACOB WIKER,
F. C. DIETRICH,
Board of Public Works.

E. W. MILES,
Clerk Hammond Water Department.

### CALIFORNIA!

INDUSTRIAL SITES aroung San Francisco Bay are handled by our industrial department, in charge of an experienced engineer. Information freely given. (Continuously in business 23 years).

**F. F. PORTER**, Porter Bldg., Oakland, Calif.

**WANTED**

Allied Chemical sundry or novelty for our sales department. Send full details.

A. W. T. CO.
Box 1005 New Haven, Conn.

### Wanted—Equipment for Complete Chemical Plant

Dryers, Filter Presses, Centrifugals, Evaporators, Durirons, Grinding Equipment.

W-410, Chem. and Met. Engineering 10th Ave. at 36th St., New York City.

### Chemical Processes

New manufactures suggested and methods worked out. Hundreds of up-to-date processes available. Cheap and efficient plant designed. Expert advice in all Branches of Chemical Industry. Inquiries treated in strict confidence.

C. GRAFTON
108 Jermyn St., St. James's, London, S.W.1., England

FOR SALE

### Testing Laboratory

An established and growing commercial in large Southern New England city. Excellent opportunity.

BO-452, Chem. & Met. Engineering 10th Ave. at 36th St., New York City.

### WE WANT YOUR PLATINUM SCRAP

**IN ANY FORM**

We pay highest market price, make prompt returns and hold goods for your approval. Pure Gold, Silver and Platinum always on hand. Industrial Diamonds and Precious Stones Bought.

**I. MILLER**, *Smelter and Refiner*, 252 Colonial Arcade, Cleveland, Ohio

**FILLER $5.00 PER TON**
Suitable for
PAINT, RUBBER, ASPHALT, TARS, Etc.
2 to 5 tons Daily Available—
70% Calcium Sulphate and 30% Asbestos
A bone dry—amorphous powder—Free from grit.
Write for sample and further particulars.
F8-347, Chem. & Met. Engrg.,
10th Ave. at 36th St., New York City

**MONEL METAL WIRE CLOTH**

100-ft. roll, 3 ft. wide; No. 33 wire, 35 mesh. Price 40c. sq. ft.; will divide.

J. L. DARBY,
Drexel Bldg., Philadelphia, Pa.

**FOR SALE**

1—**Horizontal Acid Mix Tank,** 8 x 30-ft., all plates ½-in. thick, convex ends, complete with agitating system, 11,000 gal. capacity.

1—**Horizontal Acid Storage Tank,** 6 x 25-ft. convex ends, ⅜-in. plates.

1—**Vertical Tank,** 12 x 20-ft., plates ⅜ and ¼ in. thick, 3/16-in. conical top, ⅜-in. flat bottom, 28,000 gal. capacity.

***The above tanks are in first class condition. For detailed information wire, or write.***

**E. H. MORFORD AND COMPANY, Nitro, W. Va.**

**SPECIALS**

Copper Columns—12-in., 15-in., 30-in., 38-in., 42-in., 54 in.
Copper Evaporators—1—24-in.; 1—36-in.
4—150 sq. ft. Copper Condensers.
4—60 gal. Dopp Kettles, jackets.
2—400 gal. Steel Kettles, jackets, agitators.
1—500 gal. Dopp Kettle, jacket, agitator.
2—1000 gal. Devine Sulphonators.
1—1,500 gal. Steel Kettle, jacket.
1—150 gal. Fusion Pot.
1—400 gal. Fusion Kettle, cover, agitator.
3—5-ft.x16-in. Horizontal Digesters, agitators.
2—24-in. Sperry Filter Presses, iron.
1—24-in. Sperry Filter Press, wood.
2—42-in. Filter Presses, wood.
2—[illegible] Presses, 5, 6 and 7.
1—6-ft.x3-ft. Rotary Filter.
2—40-in. Tolhurst Suspended Centrifugals, bottom discharge.
1—42-in. Rubberized Centrifugal.
1—48-in.x40-in. Buflokast Drum Dryer.
2—1 gal. Laboratory Autoclaves 800 lbs. new.
1—3½-ft.x4-ft. Pebble Mill.
1—6-ft.x7-ft. Pebble Mill.
1—6-ft.x8-ft. Tube Mill.
3—6-ft.x24-ft. Tube Mills.

**Alberger Chemical Machinery Co., Inc.**
103 Park Ave., New York City.
(at 41st St.)
Vanderbilt 2971.

**Feed Water Heaters**

7—Patterson-Allen, closed Water Heaters. Capacity 30,000,000 B.T.U. per hour or 470 gallons per minute. Size 44-in. diameter x 10-ft. 2-in. long.

5—Patterson-Allen, closed Water Heaters. Capacity 8,000,000 B.T.U. per hour or 126 gallons per minute. Size 24-in. diameter x 8-ft. 6-in. long.

1—Webster, Class B, Fe d Water Heater. Capacity 11,000 B H P. Size 10-ft. 5-in. high x 9-ft. 10-in. wide x 8-ft. 7-in. deep.

***Send for Complete Specifications***

**Nashville Industrial Corporation**
Jacksonville, Tennessee

FOR SALE

**CHEMICAL PLANT MACHINERY**

**Equipment Offered Includes**

Cast Iron Kettles, Jacketed and Agitated
Steel Kettles—Jacketed and Agitated
Pebble Mills
Pumps
Pipe Coil Condensers
Steel Tanks
Autoclaves
Filter Presses—Wood Plate and Frame and Kelly
Wood Tanks—Agitated
Enamel Kettles
Copper Stills

**E. I. DuPont De Nemours & Co.**
Lodi, N. J. and Wilmington, Del.

**KELLY FILTERS**

Loaned, bought and sold after thorough overhauling. Special parts of any description—leaves, bags, gaskets at lowest prices.

EMIL E. LUNGWITZ
99 West Street, New York.

FOR SALE

2—**Hardinge Pebble Mills 8 ft. dia. x 30 in.**
1—**8 ft. dia. Ball Mill (Hardinge).**
1—**Abbe Tube Mill.**
1—**Alsing Engineering Pebble Mill, 6 ft. dia. x 8 ft. long.**

W. W. SEARLE
50 Church Street, New York

# LOCATE QUICK BUYERS
## *for your* Used Chemical Equipment

The whole chemical industry knows the Searchlight Section of Chemical and Metallurgical Engineering as the "Opportunity" center where good used equipment to fill every need can be quickly found. Buyers look here for chances to purchase what they need.

Use "Searchlight" ads in Chemical and Metallurgical Engineering for what you wish to sell. They will have the attention of more prospective buyers than you could reach through any other source at small cost. NOW, while you have it in mind, is the time to list the items you no longer need and try the pulling power of

## *The* SEARCHLIGHT SECTION

0185

# Chemical Plant Apparatus of Quality

**DRYERS**
12—Vac. Shelf Dryers, Devine, Nos. 27, 25, 23, and 11.
2—Bronze Vac. Drum Dryers, Devine, 40 x 80.
1—Ruggles-Coles Dryer, 4 ft., 6 in. x 25 ft.
6—4 ft. x 30 ft. Ruggles-Coles Dryers.
1—5 ft. x 33 ft. Rotary Vac. Dryer.
2—5 ft. x 6 ft. Atmospheric Drum Dryers.
1—American Process Dryer, 4 ft., 6 in. x 30 ft.
4—Proctor Dryers, 2, 4 and 8 truck cap.
6—Gordon Dryers, Shelf and Truck Type.

**DISTILLING APPARATUS**
1—60 in. Fractionating, column unit (copper).
9—54 in. Badger, column unit (copper) new.
2—Copper Vac. Stills, 30, 50 and 75 gal. cap.

**REFRIGERATING PLANTS**
Large quantity of Refrigerating Units, new and used, at a great saving; 2 to 100 ton cap.

**ACID PROOF EQUIPMENT**
Duriron Kettles, cocks, flanged and bell pipe. Other new Duriron fittings.
8—New 12-in. General Ceramic's Fans.

**FILTER PRESSES**
9—Sweetland Nos. 12, 9, 7, 3 and 1.
9—Kelly Filters, Nos. 550, 450, 250, 150.
3—Oliver & Industrial Filters, 6 ft. x 6 ft.
1—Independent Filter, 30 x 42 in.
2—Shriver Filters, 42 in. x 42 in.
12—Shriver, 24 x 24.
6—No. 6 Sharples Separators.
11—Shriver Filters, 18 x 18, iron.

**CENTRIFUGALS**
2—Copper Basket, 36 in. S. & U.
3—Copper Basket, 26 in.
2—Steel Basket, Poland, 44 in., rubber lined.
18—Steel Basket, 42 in. Centrifugals.
2—Copper Basket, Tolhurst, 40 in.
3—Bronze Basket, (new), 36 in.

**ALUMINUM KETTLES AND STILLS**
70—Aluminum Jacketed Kettles and Stills from 80 to 100 gal. cap.

**GRINDING AND PULVERIZING EQUIPMENT**
2—0000 Raymond Mills.
1—Tube Mill, 44 in. x 20 ft.
2—Patterson Ball Mills, wood lined, 7 ft., 6 in. x 10 ft., New.

*Wire—Phone—Write*

**CONSOLIDATED PRODUCTS CO., Inc.**

Phone-Barclay 0603
Cable Address, Equipment
15 Park Row, New York City

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**GOOD USED**

# Machinery

**FOR SALE CHEAP**

10—**Aluminum Stills,** capacities 55-80-115 and 140 gals. New.
1—75 gal. **Jacketed Copper Still.**
90—**Aluminum Kettles;** jacketed with cover, stand and outlet fittings; capacities 40-60-80 and 100 gals. New.
13—Copper Kettles, 150, 100, 60, 40 and 25 gal. capacities.
32—**Jacketed Dopp Kettles;** capacities 40-60-75 and 120 gals. New.
10—300 gal. **Jacketed Stokes Mixers,** with supports. New.
4—300 gal. **Sulphonators.** New.
17—450 gal. **Day Jumbo Mixers.**
2—1000 gal. **Steel Mixers.** New.
2—10,000 gal. **Wooden Tanks.**
1—**Devine Vacuum Shelf Dryer.**
5—**Stoneware-Lined Exhaust Blowers.**
1—24-in. sq. **Sperry C. I. Filter Press.**
1—18-in. sq. **Sperry Wooden Press.**
1—**Clayton Air Compressor,** 4¾ x 4¾.
3—50 gal. **Enamelled-lined Jacketed Kettles, Tilting Type.**
1—5-hp. **Gas Engine.**
1—30-hp. **Westinghouse Steam Engine.**
1—8 gal. **Ross Mixer.**
1—150 gal. **Day Mixer.**
1—**Devine Vacuum Shelf Dryer;** 20 shelves.

Also: Centrifugals, Pebble Mills, Blowers, Pumps and Storage Tanks.

**Machinery & Equipment Co., Inc.**
225-231 Sherman Ave., Newark, N. J.

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# Chemical Apparatus

**PULVERIZER**
1—No. 0 Raymond Pulverizer.

**MILLS**
1—18-in. Cogswell Mill.
2—6-ft.x 5-ft. Pebble Mills.
2—6-ft.x10-ft. Pebble Mills.

**FILTER PRESSES**
1—30-in. Shriver Filter Press, 36 chambers.
1—36-in. Shriver Filter Press, 36 chambers.
1—No. 3 Sweetland Filter Press, 29 leaves.

**EXTRACTORS**
4—40-in. Tolhurst Extractors, suspended type.
5—40-in. Tolhurst Extractors, self-balancing type.

**MIXERS**
2—400-gal. Stokes, horizontal heavy duty mixers.

**CONDENSERS**
3—400 sq. ft. Copper Tube Condensers.

**RECTIFICATION UNIT**
1—E. B. Badger, 48-in. Copper Rectification Unit.

**GLANDER & COMPANY, INC.**
800 Broad Street, Newark, N. J.
Telephone Market 8239.

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# DISMANTLING

***MUST BE REMOVED!***

**Entire Plant, Buildings, Machinery and Equipment**
of
**N. K. FAIRBANKS CO.**
From 18th to 20th Sts.
on Wentworth Ave., Chicago, Ill.
(Gold Dust Twins)

**CHEMICAL EQUIPMENT**
Complete Glycerin, Soap, Hydrogenating, Oil Refining and fatty acid plants. Soap kettles, evaporators, can-making machinery.

**POWER EQUIPMENT**
200-kw., dir. conn., D.C. generating unit; 110-v. motors; hundreds of steam pumps; boiler tubes; pipe, steam engines, coal crusher, coal conveyors, fans, pulleys, hangers, shafting, belting.

**TANKS**
Over a thousand tanks of all sizes, square and round from 400-gal., to 250,000-gal. capacity. This lot includes scale tanks.

*It Will Pay You to Visit and Inspect This Plant*

**American House Wrecking Co.**
231 W. 19th Street, Chicago, Ill.
Phone, Victory 9237

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KEHOE

# Immediate Delivery

4½-ft.x20-ft. Gates Tube Mill.
32-in. Tolhurst Self-balancing Centrifugal.
250-gal. Sulphonator, complete.
6-ft. 4-in. dia. x 2-ft. Atmospheric Evaporator.
42-in. dia. x 42-in. deep C.I. Reduction Kettle.

**Send Your Inquiries to**

**ROBERT P. KEHOE**
7 East 42nd St., New York City.
Yards: 141st and 142nd St. and Jackson Ave., Bronx and Astoria, L. I.
Telephone Vanderbilt 9594-9595.

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# *Notice to Advertisers*

Owing to the holiday — Independence Day, Wednesday, July 4th — the *"Searchlight"* pages of the July 9th issue of *Chemical and Metallurgical Engineering* will close for press a day earlier than usual.

**Changes of Copy** and new advertisements for the July 9th issue should reach us on or before

**10 A. M., Tuesday, July 3rd**

---

**Good Used Equipment For Sale**

1—No. 2, 5, 6, 7, 9, and 12 Sweetland Filters.
1—3-ft.x4-ft. **Oliver Acid Resisting Continuous Filter.**
1—3-ft.x4-ft. **Oliver Continuous Filter.**
1—6-ft.x4-ft. **Oliver Filter.**
1—18-, 36-, 42-in. **Johnson Filter Press.**
1—24-in., 30-in. **Shriver Filter Presses.**
1—4-ft.x5-ft. **Patterson Ball Mill.**
1—3-ft.x3-ft. 6-in. **Abbe Pebble Mill.**
1—42-in. **Schaum & Uhlinger Steel Basket Extractor.**
2—40-in. **Tolhurst Cop. Basket Extractors.**
2—48-in. **Tolhurst Cop. Basket Extractors.**
6—5-ft. 6 in.x5-ft. **Open Top Tanks.**
2—8-ft.x30-ft. **Horizontal Steel Tanks.**
1—4-ft.x16-ft. **Glens Falls Rot. Sul. Burner.**
1—**Tirrell Gas Equalizing Unit.**
1—4-ft.x20-ft. **Stokes Rotary Vac. Dryer.**
6,000 ft. **all wood Stave Pipe** in various size NEW, NEVER USED

*All Kinds of Chemical Equipment. Complete Plants Bought and Sold.*

**W. H. CAMPBELL, INC.**
30 Church St., N. Y. City Cortland 5727-8755

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# STIRLING BOILERS

**823 Horse Power**
**Operated Less Than 90 Days**

30—Class M-30 823 H.P. Babcock and Wilcox Stirling Water Tube Boilers, 200 lbs. pressure. Drums double riveted, double strap butt joint. Complete with Westinghouse Stokers, Forced Draft Fans, Vulcan Soot Blowers and all accessories. Inspection invited.

***Send for Our Special Specifications Folder.***

**Nashville Industrial Corporation**
Jacksonville, Tennessee

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# New Dryers

Unusual bargain of 20 Steam-heated Air Dryers, 4 ft. 0 in. diameter, 30 ft. long, for chemicals, intended for Government use during war. Write us for particulars.

**McDermott Bros. Co.**
Allentown, Penna.

---

FOR SALE

**Pumps, Plain and Jacketed Tanks, Grinders, Nitrators, Pulleys**

and other equipment used in pigment and chemical manufacture. If interested apply

**B. E. NELSON**
SHERWIN WILLIAMS COMPANY,
Pullman Station, Chicago.

## JOHN F. ABERNETHY

Lead Burning — Lead Lined Tanks

Lead Work of Every Description

708 Myrtle Ave., BROOKLYN, N. Y.

## W. L. DUNN & J. W. PUGH

Chemical, Metallurgical and Industrial Engineers

**Plant Design, Construction, Operation**

*Specialists in Electrochemical and Electrometallurgical Processes*

P. O. Box 981, St. Louis, Mo.

## DWIGHT & LLOYD SINTERING CO.

*Special Problems in Ore Treatment*

29 Broadway, New York—Cable, "Sinterer"

## ELDRED & ATKINSON, INC.

*Chemical Advisers and Engineers*

New York Office: 48 East 41st St. — Mamaroneck, N. Y.

## ELECTRICAL TESTING LABORATORIES

Tests

80th St. and East End Ave.
NEW YORK, N. Y.

## FRANK R. GUNN COMPANY

**Analytical and Consulting Chemists**

Steel, Alloys, Coal, Coke, Waters, Oil, Soaps, Fertilizers and Fertilizer Materials

2313 W. Atlantic St., Philadelphia, Pa.

## JOSEPH W. HARRIS

Ex-member Examining Corps, Chemical, Electrical and Metallurgical Patents. Over 15 years' experience. Washington Loan and Trust Bldg., Washington, D. C.

## HOCHSTADTER LABORATORIES

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**Pipe and Fittings, Wood**
National Tank & Pipe Co.
Pacific Tank & Pipe Co.
Worthington Pump & Machinery Corp.

**Pipe Covering, Wood**
Pacific Tank & Pipe Co.

**Pipe, Silica Ware**
General Ceramics Co.

**Pipes, Steam Jacketed**
Parks-Cramer Co.
Toledo Pipe Threading Machy. Co.

**Plates, Screw, Cutting & Threading**
Toledo Pipe Threading Machine Co.

**Plates, Tank, Steel**
Ryerson & Son, J. T.

**Platework, Riveted & Welded**
Bethlehem Fdy. & Mach. Corp.
Stevens-Aylsworth Co., Inc.

**Platinum Wire, Sheet, Foil Crucibles, Lab. Ware, all kinds**
American Platinum Wks.
Baker & Co., Inc.
Bishop, J. & Co., Plat. Wks.

**Porcelain Ware**
Coors Porcelain Co.
C. P. Chemical & Drug Co.

**Pots and Jars, Acid Proof**
Bethlehem Fdy. & Mach. Corp.
U. S. Stoneware Co.

**Powdered Coal Equipment**
Raymond Bros. Impt. Pul. Co.

**Precipitators, Centrifugal**
American Tool & Mach. Co.
Fletcher Works
Tolhurst Machine Works

**Presses, Hydraulic**
Hydraulic Press Mfg. Co.
Phila. Drying Machy. Co.

**Pulleys, Magnetic**
Ding's Magnetic Separator Co.

**Pulverized Coal Equipment**
Hardinge Co.
Raymond Bros. Engrg. Co.
Ruggles-Coles Eng. Co.
Steacy-Schmidt Mfg. Co

**Pulverizers, Ore**
Hardinge Co.
Ruggles-Coles Eng. Co.
Steacy-Schmidt Mfg. Co.

**Pump Governors**
*(See Governors)*

**Pumps, Acid Proof**
American Well Works
Duriron Co.
Goulds Mfg. Co.
Oliver Continuous Filter Co.
Schutte & Koerting
United Lead Co.

**Pumps, Air Lift**
Ingersoll-Rand Co.
Schutte & Koerting

**Pumps, Bilge, Brine, Circulating, Deep Well, Fire, Mine, Quarry, etc.**
American Well Works

**Pumps, Centrifugal**
American Well Works
Duriron Co.
Ingersoll-Rand Co.
Taber Pump Co.

**Pumps, Deep Well, Fire, Mine and Quarry, etc.**
Ingersoll-Rand Co.

**Pumps, Gas or Liquid**
Devine Co., J. P.

**Pumps, Pneumatic**
Ingersoll-Rand Co.

**Pumps, Rotary**
Connersville Blower Co.
Ingersoll-Rand Co.
Roots Co., P. H. & F. M.
Taber Pump Co.

**Pumps, Steam**
Ingersoll-Rand Co.

**Pumps, Vacuum**
Buffalo Fdry. & Mach. Co.
Connersville Blower Co.
Devine Co., J. P.
Ingersoll-Rand Co.
Oliver Continuous Filter Co.
Roots Co., P. H. & F. M.
Sullivan Mach. Co.

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Calorizing Co.
Coors Porcelain Co.
McDanel Refractory Porcelain Co.

**Pyrometers**
Bristol Co., The
Hoskins Mfg. Co.
Taylor Instrument Co.

**Recorders, Specific Gravity**
Bailey Meter Co.

**Recording Instruments**
Bailey Meter Co.
Bristol Co., The
Foxboro Co., Inc., The
Schaeffer & Budenberg Mfg. Co. & Amer. Steam Gauge & Valve Mfg. Co. Div.

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Harbison-Walker Refractories Co.

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Crane Co.
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Tyler Co., W. S.

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Ludlow-Saylor Wire Co.
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Sturtevant Mill Co.

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Fletcher Works
Tolhurst Machine Works

**Separators, Incline Vibratory Screens**
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Magnetic Mfg. Co.

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Beaumont Co., R. H.

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Spray Eng. Co.

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Knight, M. A.
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United Lea dCo.

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Hauser-Stander Tank Co.
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General Ceramics Co.
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Hauser-Stander Tank Co.

**Towers and Accessories, Acid Proof, Chemical**
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American Transformer Co.

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Nicholson & Co., W. H.
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Roto Co.

**Turbo Blowers**
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**Uranium Alloy**
Standard Alloys Co.

**Valves**
Merrill Co., The

**Valves, Air or Steam Operating**
Nicholson & Co., W. H.

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Duriron Co.
United Lead Co.

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Fulton Co.
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Toch Bros.

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Cleveland Wire Cloth & Mfg. Co.
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Zaremba Co

**Zinc, Sheets & Coils**
Illinois Zinc Co.

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